Chilton's

MAVERICK /COMET 1970-76

REPAIR & TUNE-UP GUIDE

8033

Maverick 1970-1976
Comet 1971-1976

564 219

Repairs
Specifications
Troubleshooting
Do-It-Yourself Maintenance

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1 · General Information and Maintenance

Introduction

In April of 1969, Ford introduced the Maverick. The car was billed as the "simple machine", the first car of the '70's. The Maverick was designed to be economical to operate and to fix, stressing the point that many small repairs and adjustments could be performed by the owner with only a screwdriver and a small set of tools.

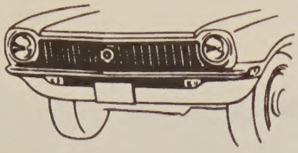
What started out as a reskinned Falcon did very well for Ford during 1969 and 1970, until the Pinto could be unleashed to stem the import tide. Ford wisely selected time proven mechanicals that first appeared in the Falcon in 1960, such as the engine, drive train, steering, suspension and brakes.

The 1970 Maverick proved so successful that Mercury decided to introduce its own version. Thus, in September of 1970, the Mercury Comet was introduced. A 302 V8 was made available as optional equipment on the Comet. Both the Maverick and Comet came on two wheelbases starting in 1971; a 103 in. wheelbase for the 2-door models and a 109.9 in. wheelbase for the 4-door models. Also in 1971, sporty versions of the 2-door sedan were introduced, called the Maverick Grabber and Comet GT, respectively. For 1972, Maverick got its own 302 V8.

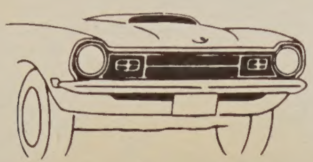
By the time the 1973 model year rolled around, emission controls and safety equipment were taking their toll, decreasing the power output of the engines and adding hundreds of pounds to a once light chassis. The smallest six-cylinder engine was dropped from both models in 1973. The developing trend was to place less emphasis on the performance and simplicity aspects of the car and concentrate on building an image of "the well-built small car." The Luxury Decor Option (LDO) was introduced in that year, including such niceties as standard cut-pile carpeting, color-keyed vinyl roof and wheel covers, reclining contoured bucket seats and steel-belted radial tires.

For 1976, the same successful theme has been continued for the seventh straight model year. Maverick and Comet both offer small car ease and handling, fuel economy and simplicity of maintenance and repair. In addition, they offer reliable components in a solid unibody package at a relatively low price. Beginning in 1974, front disc brakes are available.

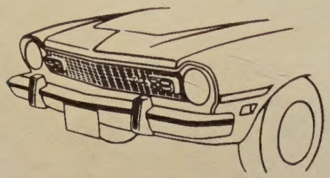
Model Identification



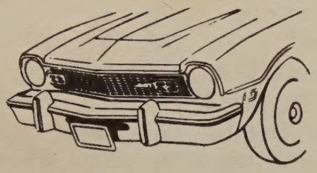
1970–72 Maverick



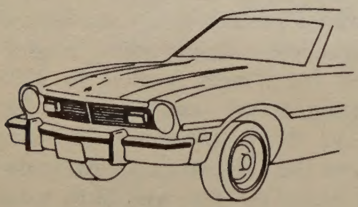
1971–72 Maverick Grabber



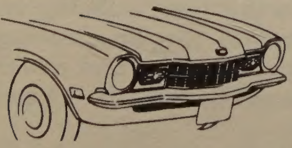
1973 Maverick



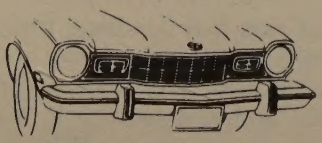
1974–75 Maverick



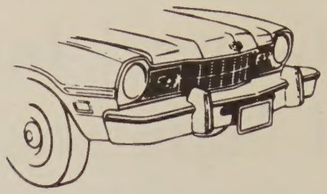
1976 Maverick



1971–72 Comet



1973 Comet



1974–76 Comet

Serial Number

ℱ3S56H100001ℱ

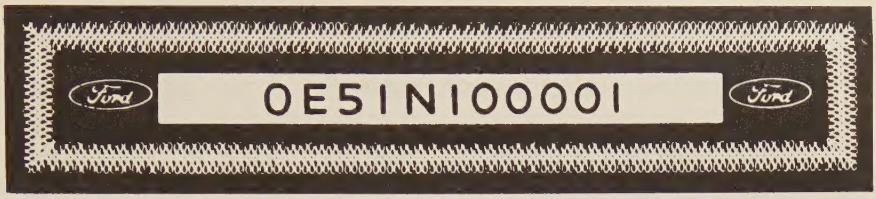
Typical Vehicle Identification Number—1972–76

VEHICLE IDENTIFICATION NUMBER

The official vehicle identification number for title and registration purposes is stamped on a metal tag, which is fastened to the top of the instrument panel. The tag is located on the driver's side, visible through the windshield. The first digit in the vehicle identification number is the model year of the car (0—1970, 4—1974, etc.). The second digit is the assembly plant code for the plant in which the vehicle was built. The third and fourth digits are the body serial code designations (2-dr sdn, 4-dr sdn). The fifth digit is the engine code which identifies the type of engine originally installed in the vehicle (see accompanying chart). The last six digits are the consecutive unit numbers which start at 100,001 for the first car of a model year built at each assembly plant.

VEHICLE CERTIFICATION LABEL

The vehicle certification label is attached to the left door lock pillar. The top half of the label contains the name of the vehicle manufacturer, date of manufacture and the manufacturer's certification statement. On 1973 and later models, the top half of the label also contains the gross vehicle weight rating and the front and rear gross vehicle axle ratings. The gross vehicle weight rating is useful in determining the load carrying capacity of your car. Merely subtract the curb weight from the posted gross weight and what is left over is how much you can haul around. The bottom half of the vehicle certification label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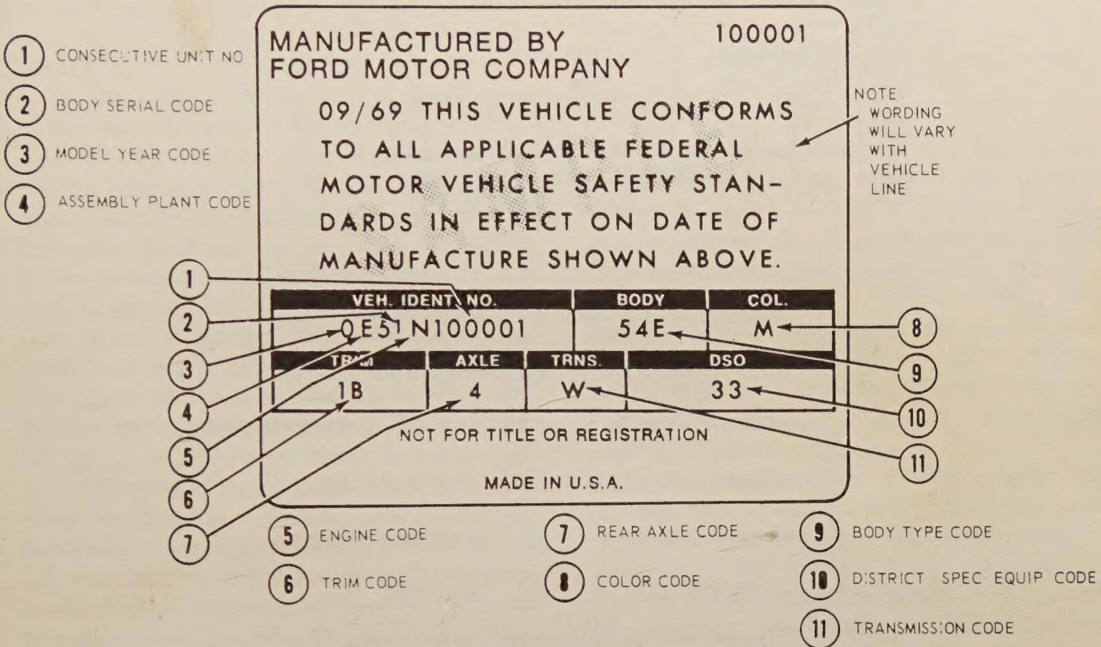
Typical Vehicle Identification Number—1970–71

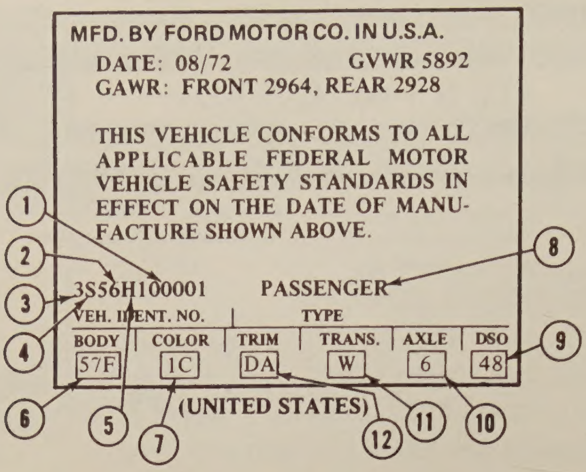

① CONSECUTIVE UNIT NO
② BODY SERIAL CODE
③ MODEL YEAR CODE
④ ASSEMBLY PLANT CODE
MANUFACTURED BY FORD MOTOR COMPANY
100001
09/69 THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON DATE OF MANUFACTURE SHOWN ABOVE.
NOTE: WORDING WILL VARY WITH VEHICLE LINE
VEH. IDENT. NO.
0E51N100001
BODY
54E
COL.
M
TRIM
1B
AXLE
4
TRNS.
W
DSO
33
NOT FOR TITLE OR REGISTRATION
MADE IN U.S.A.
1
2
3
4
5
6
7
8
9
10
11
⑤ ENGINE CODE
⑥ TRIM CODE
⑦ REAR AXLE CODE
⑧ COLOR CODE
⑨ BODY TYPE CODE
⑩ DISTRICT SPEC EQUIP CODE
⑪ TRANSMISSION CODE

Typical Vehicle Certification Label—1970–72

Engine Codes

Displacement	*bbl*	*Horsepower*	*'70*	*'71*	*'72*	*'73*	*'74*	*'75*	*'76*
6-170	1	82 (net)			U				
6-170	1	100		U					
6-170	1	105	U						
6-200	1	74,75 (net) *						T	
6-200	1	78, 81 (net) *							T
6-200	1	84 (net)				T	T		
6-200	1	91 (net)			T				
6-200	1	115		T					
6-200	1	120	T						
6-250	1	70, 72, 85 (net) *						L	
6-250	1	78, 81, 90 (net) *							L
6-250	1	88, 93 (net) *				L	L		
6-250	1	98 (net)			L				
6-250	1	145		L					
6-250	1	155	L						
8-302	2	115, 122 (net) *						F	
8-302	2	137, 138 (net)				F	F		F
8-302	2	143 (net)			F				
8-302	2	210		F					

* Net horsepower rating varies with vehicle installation.


MFD. BY FORD MOTOR CO. IN U.S.A.
DATE: 08/72
GVWR 5892
GAWR: FRONT 2964, REAR 2928
THIS VEHICLE CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.
3S56H100001
PASSENGER
VEH. IDENT. NO.
TYPE
BODY
COLOR
TRIM
TRANS.
AXLE
DSO
57F
1C
DA
W
6
48
(UNITED STATES)
1
2
3
4
5
6
7
8
9
10
11
12

① CONSECUTIVE UNIT NO.
② BODY SERIAL CODE
③ MODEL YEAR CODE
④ ASSEMBLY PLANT CODE
⑤ ENGINE CODE
⑥ BODY TYPE CODE
⑦ COLOR CODE
⑧ VEHICLE TYPE
⑨ DISTRICT – SPECIAL EQUIPMENT
⑩ REAR AXLE CODE
⑪ TRANSMISSION CODE
⑫ TRIM CODE

Typical Vehicle Certification Label—1973–76

Transmission Codes

Type	*'70*	*'71*	*72*	*'73*	*'74*	*'75–'76*
3-speed manual	1	1	1	1	1	1
Semi-automatic stick shift	V					
C4 automatic	W	W	W	W	W	W

contains the vehicle identification number (as previously described), the body type code, the exterior paint color code, the interior trim color and material code, the rear axle code (see accompanying chart), the transmission code (see accompanying chart) and the district and special order codes.

The vehicle certification label is constructed of special material to guard against its alteration. If it is tampered with or removed, it will be destroyed or the word "VOID" will appear.

Rear Axle Ratio Codes

Ratio	*'70*	*'71*	*'72*	*'73*	*'74*	*'75–'76*
2.79:1		3	3	3	3	3
2.83:1	5					
3.00:1		6	6	6	6	6
3.08:1	C					
3.20:1	8					

OIL RECOMMENDATIONS

When adding oil to the crankcase or changing the oil or filter, it is important that oil of an equal quality to original equipment be used in your car. The use of inferior oils may void your warranty. Generally speaking, oil that has been rated "SE, heavy-duty detergent" by the American Petroleum Institute will prove satisfactory.

Oil of the SE variety performs a multitude of functions in addition to its basic job of reducing friction of the engine's moving parts. Through a balanced formula of polymeric dispersants and metallic detergents, the oil prevents high temperature and low temperature deposits and also keeps sludge and dirt particles in suspension. Acids, particularly sulphuric acid, as well as other by-products of combustion of sulphur fuels, are neutralized by the oil. These acids, if permitted to concentrate, may cause corrosion and rapid wear of the internal parts of the engine.

It is important to choose an oil of the proper viscosity for climatic and operational conditions. Viscosity is an index of the oil's thickness at different temperatures. A thicker oil (higher numerical rating) is needed for high temperature operation, whereas thinner oil (lower numerical rating) is required for cold weather operation. Due to the need for an oil that embodies both these characteristics in parts of the country where there is wide temperature variation within a small period of time, multigrade oils have been developed. Basically, a multigrade oil is thinner at low temperatures and thicker at high temperatures. For example, a 20W–40 oil exhibits the characteristics of a 20 weight oil when the car is first started and the oil is cold. Its lighter weight allows it to travel to the lubricating surfaces quicker and offer less resistance to starter motor cranking than, let's say, a straight 30 weight oil. But after the engine reaches operating temperature, the 20W–40 oil begins acting like a straight 40 weight oil, its heavier weight providing greater lubricating protection and less susceptibility to foaming than a straight 30 weight oil. Whatever your driving needs, the oil viscosity–temperature chart should prove useful in selecting the proper grade. The SAE viscosity rating is printed or stamped on the top of every oil container.

Oil Viscosity–Temperature Chart

When outside temperature is consistently	*Use SAE viscosity number*
Single Grade Oils	
—10°F to 32°F	10W
10°F to 60°F	20W–20
32°F to 90°F	30
Above 60°F	40
Multigrade Oils	
Below 32°F	* 5W–30
—10°F to 90°F	10W–30
Above —10°F	10W–40
Above 10°F	20W–40

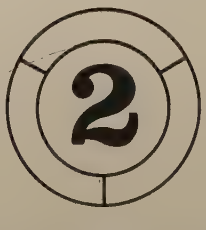
* When sustained high-speed operation is anticipated, use the next higher grade.

FUEL RECOMMENDATIONS

It is important that you use fuel of the proper octane rating in your car. Octane rating is based on the quantity of anti-knock compounds added to the fuel and it determines the speed at which the gas will burn. The lower the octane rating, the faster it burns. The higher the octane, the slower the fuel will burn and a greater percentage of compounds in the fuel to prevent spark ping (knock), detonation and pre-ignition (dieseling).

As the temperature of the engine increases, the air-fuel mixture exhibits a tendency to ignite before the spark plug is fired and the exhaust valve opened. If fuel of an octane rating that is too low for the engine is used, this will allow combustion to occur before the piston has completed its compression stroke, thereby driving the piston downward while it is still attempting to travel upward.

Fuel of the proper octane rating, for the compression ratio and ignition timing of your car, will slow the combustion process sufficiently to allow the spark plug enough time to ignite the mixture completely and also allow time for the exhaust valve to open. All Mavericks and Comets are designed to run on regular fuel. The use of some "super-premium" fuel is no substitution for a properly tuned and maintained engine. Chances are that if your engine exhibits any signs of spark ping, detonation or pre-ignition when using regular fuel, the



Symbol for 91 Octane "Regular" Fuel

ignition timing should be checked against specifications or the cylinder head should be removed for decarbonizing. This, of course, does not apply if a former owner or yourself has had the cylinder head shaved (raising the compression ratio) or has bumped ahead (advanced) the ignition timing for increased performance. If the engine has been modified, then you will have to try different fuels until you find one that works best.

If you find yourself out of fuel in some remote place and the only fuel available is of a lower octane than that required by your engine, you may use a small quantity of it after retarding the ignition advance a maximum of 2 degrees from its stock setting. This will reduce performance a bit, but it will get you to the next gas station. Remember that spark ping, detonation, and pre-ignition (running-on after the ignition is switched off) over extended periods of time will result in damage to the tops of the pistons and burned exhaust valves, necessitating costly repairs.

CAUTION: *All 1975–76 models equipped with a catalytic converter must use unleaded gasoline. Leaded fuel will deteriorate the effectiveness of the converter.*

Routine Maintenance

Maintenance Interval Chart

The numerals in the maintenance chart represent the suggested intervals between service in thousands of miles or number of months, whichever occurs first.

4,000 miles or 4 months	4
5,000 miles or 5 months	5
6,000 miles or 6 months	6
8,000 miles or 8 months	8
12,000 miles or 12 months	12
15,000 miles or 15 months	15
20,000 miles or 20 months	20
24,000 miles or 24 months	24
30,000 miles or 30 months	30
36,000 miles or 36 months	36
40,000 miles or 40 months	40
As Needed	A/N
Does not apply	—

Chassis

Operation	*'70*	*'71*	*'72*	*'73*	*'74*	*'75*	*'76*
Automatic transmission band adjustment	12 ③	12 ③	12 ③	12 ③	12 ③	15 ③	20 ③
Automatic transmission kickdown and shift linkage lubrication	A/N	A/N	A/N	12	12	A/N	A/N
Brake linings and hydraulic system inspection	30	30	30	24	24	25	30
Brake master cylinder level check	6	6	6	4	4	5	5
Clutch pedal free-play adjustment	6	6	6	8	8	10	10
Front Suspension ball joints lubrication	36	36	36	36	36	30	30
Front wheel bearings cleaning and repacking	30	30	30	24	24	25	30
Manual transmission and clutch linkage lubrication	A/N	A/N	A/N	12	12	A/N	A/N
Parking brake adjustment	As Needed						
Power steering control valve ball stud lubrication	36	36	36	36	36	30	30
Power steering reservoir fluid level check	6	6	6	4	4	5	5
Rear axle fluid level check	6	6	6	8	8	10	10
Steering arm stops lubrication	6	12	12	12	12	15	15
Steering linkage and seals inspection	12	12	12	12	12	15	15
Tire rotation	As Needed						
Transmission fluid level check	6	6	6	8	8	10	10
Wheel alignment	As Needed						

③ Except for severe service or fleet use, adjust at 12,000 miles or 12 months only.

Engine

Operation	'70	'71	'72	'73	'74	'75	'76
Air filter replacement—six-cylinder	12	12	12	12	12	30	30
Air filter replacement—eight-cylinder	—	24	12	12	12	20	20
Air intake temperature control check	—	—	12	12	12	15	15
Compression check	24	24	24	24	24	A/N	A/N
Contact point and condenser replacement, dwell angle adjustment	12	12	12	12	12	—	—
Coolant draining and flushing	24 *	24 *	24 *	24 *	24 *	40	40
Coolant level check	Monthly						
Cooling system leakage check	12	12	12	12	12	40	40
Crankcase filler cap cleaning	6	6	6	12	12	20	20
Crankcase ventilation filter (in air cleaner) replacement	—	6	6	8	8	20	20
Distributor cap and rotor check	24	24	24	24	24	20	20
Drive belt adjustment	12	12	12	12	12	15	15
Evaporative emission control canister and purge hose inspection	—	24	24	24	24	20	20
Evaporative emission control hoses, vapor lines and fuel tank filler cap inspection	—	①	①	12	12	20	20
Evaporative emission control valve replacement (California only)	12	—	—	—	—	—	—
Exhaust Gas Recirculation (EGR) valve passages, carburetor spacer, and intake manifold (302 only) cleaning, EGR delay valve replacement	—	—	—	12	12	③ A/N	③ A/N
Fuel filter replacement, fuel system leakage check	12	12	12	12	12	15	10
Idle fuel mixture, curb and fast idle adjustments	12	12	12	12	12	15	15
Ignition timing adjustment	12	12	12	12	12	A/N	A/N
Intake manifold torque check (302 only)	—	12	12	12	12	20	20
Oil change	6	6	6	4	4	5	5
Oil filter replacement	6	6	6	8	8	10	10
Oil level check	At Fuel Stops						
Positive Crankcase Ventilation (PCV) valve replacement and ventilation hoses inspection	12	12	12	12	12	15	15
Spark control system check	—	—	12	12	12	15	15
Spark delay and choke delay valve replacement	—	—	12 #	12	12	15	15
Spark plug replacement and plug wire inspection	12	12	12	12	12	15	15
Thermactor hose inspection	—	—	—	—	12 ②	15	15
Throttle and choke plate linkage, air valve, throttle solenoid and dashpot inspection	12	12	12	12	12	15	15
TRS or throttle solenoid fuse check	—	—	—	4	4	—	—
Throttle solenoid "off" speed adjustment	—	—	12	12	12	15	15

* Every two years regardless of mileage.
# Spark delay valve only.
① 48,000 mi. or one year, whichever occurs first.
② Vehicles manufactured for sale in California only.
③ Cars using unleaded fuel need no regular EGR system maintenance.

Body

Operation	'70	'71	'72	'73	'74	'75	'76
Doors, hood and trunk hinges, checks and latches lubrication	6	6	6	4	4	A/N	A/N
Drain hole cleaning	As Needed						
Lock cylinders lubrication	6	6	6	4	4	A/N	A/N
Wiper blade replacement	As Needed						

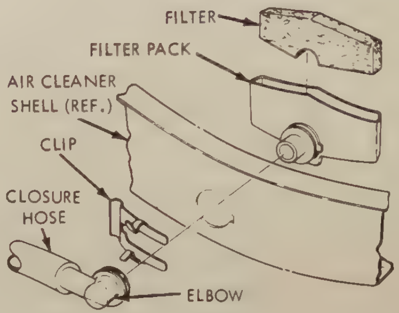
AIR FILTER REPLACEMENT

At the recommended intervals in the maintenance chart, the air filter element must be replaced. If the vehicle is operated under severely dusty conditions, the element should be changed sooner. On all six and 8-cylinder models, the air filter cover is retained with a single wing nut on top of and in the center of the cover. To replace the element, unscrew the wing nut, lift off the cover and discard the old element. While the air cleaner is removed, check the choke plate and external linkage for freedom of movement. Brush away all dirt and spray the plate corners and linkage with a small amount of penetrating cleaner/lubricant such as CRC®. Wipe the air filter housing clean with a solvent-moistened rag and install the new element with the word FRONT facing the front of the car. Install the cover and wing nut finger tight.

CRANKCASE FILLER CAP CLEANING

At the recommended intervals in the maintenance chart, the oil filler cap must be cleaned. Disconnect the positive crankcase ventilation hose (if so equipped) from the cap and lift the cap from the rocker cover. Soak the cap in kerosene or mineral spirits to clean the internal element of sludge and blow-by material. After agitating the cap in the solution, shake the cap dry. Reinstall the cap and connect the hose, if so equipped.

CRANKCASE VENTILATION FILTER (IN AIR CLEANER) REPLACEMENT



Crankcase Ventilation Filter, Retainer and Hose

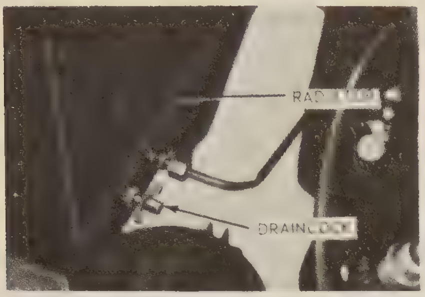
At the recommended intervals in the maintenance chart, or sooner if the car is operated in dusty areas, at low rpm, for trailer towing, or if the car is used for short runs preventing the engine from reaching operating temperature, the crankcase ventilation filter in the air cleaner must be replaced. Do not attempt to clean this filter.

To replace the filter, simply remove the air filter cover and pull the old crankcase filter out of its housing. Push a new crankcase filter into the housing and install the air filter cover.

FUEL FILTER REPLACEMENT

At the recommended intervals, the fuel filter must be replaced. The filter is located inline at the carburetor inlet. The procedure for replacing the fuel filter is as follows:

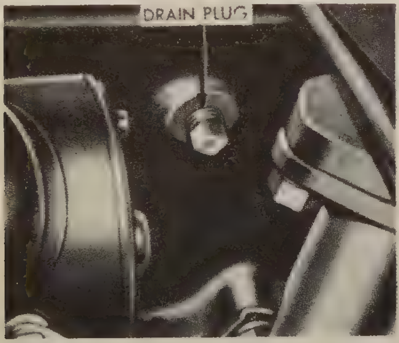
1. Remove the air filter.
2. Loosen the retaining clamp(s) securing the fuel inlet hose to the fuel filter. If the hose has crimped retaining clamps, these must be cut off and replaced.
3. Pull the hose off the fuel filter.
4. Unscrew the fuel filter from the carburetor and discard the gasket, if so equipped.
5. Install a new gasket, if so equipped, and screw the filter into the carburetor.
6. Install a new retaining clamp onto the fuel hose. Push the hose onto the fuel filter and tighten the clamp.
7. Start the engine and check for leaks.
8. Install the air filter.



Radiator Petcock (Draincock)

COOLANT DRAINING AND FLUSHING

At two year intervals or if the coolant is rusty or dirty in appearance, the cooling system must be drained and flushed. To drain the system, place a catch pan beneath the petcock (drain cock) at the bottom of the radiator and open the petcock by rotating it counterclockwise. Then, using a ⅜ in. wrench or socket, remove the cylinder block drain plug(s), taking care to catch the old coolant. On six-cylinder models, the drain plug is located at the right rear of the block, in front of the starter. On V8 models, there are two drain plugs, one on each side of the block.



Engine Block Drain Plug—Six-Cylinder Engine

To remove rust, sludge and other foreign matter from the cooling system, a cooling system cleaner should be used in the engine prior to flushing. Flushing may be accomplished either by inserting a garden hose into the radiator cap opening, or by using special pressure flushing equipment available at many service stations. In either case, the flushing should be done with the thermostat removed. When using the pressure flushing method, it is advisable to make sure that the cylinder head bolts are tightened to specifications to prevent possible coolant leakage into the cylinders. The procedure for flushing is as follows: run the engine at operating temperature for several minutes to circulate the cooling system cleaner. Using a towel, carefully remove the radiator cap, in two stages, allowing the pressure to be released before fully removing the cap. Insert a garden hose or the pressure flushing fitting into the radiator. Open the radiator petcock and remove the engine drain plug(s). Run the engine at fast idle until the water is coming out clear. Shut off the engine and then remove the garden hose or the pressure flusher. Close the petcock and install the drain plug(s). Inspect the radiator and heater hoses for cracks, bulges or soft spots and replace as required. Replace the thermostat. Consult the capacities chart and fill the cooling system to within one inch of the filler neck or to the cold-fill mark on sealed systems with a mixture of 50% water and 50% ethylene glycol antifreeze. Install the radiator cap, turning it only to the first position (off pressure), thereby allowing the system to bleed off all trapped air bubbles. Start the engine and allow it to reach operating temperature. Recheck the coolant level and add as required. Check the system for leakage.

DRIVE BELT ADJUSTMENT

At regular intervals, the tension (and condition) of the alternator, power steering (if so equipped), air conditioning (if so equipped) and Thermactor air pump (1974 California and all 1975–76 models only) drive belts should be checked, and, if necessary, adjusted. Loose belts can lead to poor engine cooling and diminish alternator, power steering pump, air conditioning compressor or Thermactor air pump output. A belt that is too tight places a severe strain on the water pump, alternator, power steering pump, compressor or air pump bearings. Replace any belt that is so glazed, worn or stretched that it cannot be tightened sufficiently. On vehicles with matched belts, replace both belts. New belts are to be adjusted to the tension of 140 lbs (except belts ¼ in. wide) or 80 lbs (¼ in. wide belts), measured on a belt tension gauge. Any belt that has been operating for a minimum of 10 minutes is considered a used belt. Used belts are adjusted to a tension of 110 lbs (except belts ¼ in.

wide) or 60 lbs (¼ in. wide belts). After installing a new belt, run the engine for 10 minutes and reset the belt tension to used belt specifications. If a belt tension gauge is not available, the following procedures may be used.

NOTE: *Drive belt tension is checked and adjusted with the engine off.*

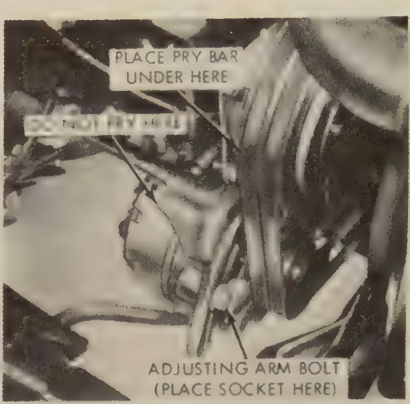
Typical Alternator Mounting and Adjusting Arm Bolts

Alternator (fan drive) Belt

ALL MODELS EXCEPT 250 SIX WITH AIR CONDITIONING

1. Position a ruler perpendicular to the drive belt at its longest run. Test the tightness of the belt by pressing it firmly with your thumb. The deflection should not exceed ¼ in.
2. If the deflection is in excess of ¼ in., loosen the alternator mounting bolt and the adjusting arm bolt.
3. Using a pry bar or a broom handle, move the alternator toward or away from the engine until the proper tension is reached. Apply tension to the front of the alternator only. Positioning the pry bar against the rear end housing will damage the alternator.
4. Holding the alternator in place, tighten the adjusting arm bolt and then recheck the belt tension. When the belt is properly tensioned, tighten the alternator mounting bolt.

250 SIX WITH AIR CONDITIONING



Pry Bar Area—250 Six-Cylinder Engine

1. Position a ruler perpendicular to the drive belt at its longest run. Test the tightness of the belt by pressing it firmly with your thumb. The deflection should not exceed ¼ in.
2. To adjust the belt tension, loosen the alternator mounting and adjusting arm bolts. Place a 9/16 in. socket on the adjusting arm bolt.
3. Using a broom handle or wooden pry bar, position the bar so that it rests on the 9/16 in. socket installed on the adjusting arm bolt. Position the other end of the pry bar beneath the air conditioner compressor.
4. Press down on the adjusting arm bolt to increase drive belt tension. When the proper tension is reached, tighten the adjusting arm bolt, then recheck the tension. Tighten the mounting bolts for the alternator.

Adjusting Power Steering Drive Belt Tension

Power Steering Drive Belt

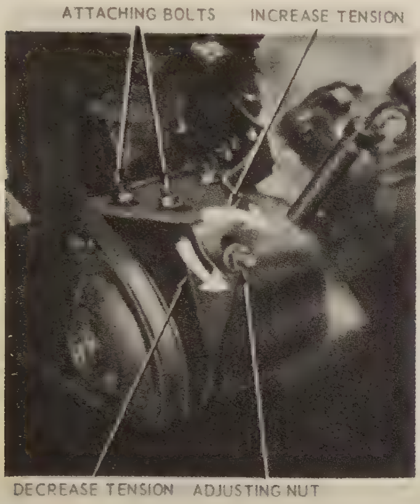
ALL SIX-CYLINDER AND 1971–72 V8 MODELS

1. Holding a ruler perpendicular to the drive belt at its longest run, test the tightness of the belt by pressing it firmly with your thumb. The deflection should not exceed ¼ in.
2. To adjust the belt tension, loosen the adjusting and mounting bolts on the front

face of the steering pump cover plate (hub side).

3. Using a pry bar or broom handle on the pump hub as shown, move the power steering pump toward or away from the engine until the proper tension is reached. Do not pry against the reservoir as it is highly malleable and easily deformed.

4. Holding the pump in place, tighten the adjusting arm bolt and then recheck the belt tension. When the belt is properly tensioned, tighten the mounting bolts.



Adjusting Power Steering Drive Belt Tension—1973–76 V8

1973–76 V8 Models

1. Holding a ruler perpendicular to the drive belt at its longest run, test the tightness of the belt by pressing it firmly with your thumb. The deflection should not exceed ¼ in.

2. To adjust the belt tension, loosen the 3 power steering pump attaching bolts.

3. Turn the power steering pump drive belt adjusting nut as needed (clockwise to increase tension and decrease deflection, counterclockwise to decrease tension and increase deflection) until the deflection is within specifications.

4. Without disturbing the pump, tighten the 3 attaching bolts.

Air Conditioner Compressor Drive Belt

1. Position a ruler perpendicular to the drive belt at its longest run. Test the tightness of the belt by pressing it firmly with your thumb. The deflection should not exceed ¼ in.

IDLER PULLEY
ADJUSTING SLOT

Adjusting Idler Pulley for Air Conditioning Drive Belt

2. If the engine is equipped with an idler pulley, loosen the idler pulley adjusting bolt, insert a pry bar between the pulley and the engine and adjust the tension accordingly. If the engine is not equipped with an idler pulley, the alternator must be moved to accomplish this adjustment, as outlined under "Alternator Drive Belt."

3. When the proper tension is reached, tighten the idler pulley adjusting bolt (if so equipped) or the alternator adjusting and mounting bolts.

BATTERY CARE

Every six months or 6,000 miles, the battery's state of charge should be checked with a hydrometer. A fully-charged battery should have a hydrometer reading of 1.260–1.310 specific gravity at 80°F electrolyte temperature. To correct readings for temperature variations, add 0.004 to the hydrometer reading for every 10°F that the electrolyte is above 80°F; subtract 0.004 for every 10°F below 80°F electrolyte temperature. The readings obtained in all six cells should be nearly equal. If any cell is markedly lower, it is defective. If this low reading is not improved by charging, the battery should be replaced, particularly before cold weather sets in. When charging a weak or sulphated (brownish color of electrolyte) battery, the slow charging method must be used. Never allow electrolyte temperature to exceed 120°F during charging.

Inspect the battery terminals for a tight fit on the poles and check for corrosion. Remove any deposits with a wire brush and coat the terminals, after placing them on the poles, with vaseline to prevent further corrosion. Check the battery case for cracks or leakage.

TIRES

The tread wear of the tires should be checked about twice a year. Tread wear should be even across the tire. Excessive wear in the center of the tread indicates overinflation. Excessive wear on the outer corners of the tread indicates underinflation. An irregular wear pattern is usually an indication of improper front wheel alignment or incorrect wheel balance. On a vehicle with improper front wheel alignment, the car will tend to pull to one side of a flat road if the steering wheel is released while driving the car. Incorrect wheel balance will usually produce vibrations at high speeds. When the front wheels are out of balance, they will produce vibration in the steering wheel, while rear wheels out of balance will produce vibration in the floor pan of the car.

Tire Pressure

One way to prolong tire life is to maintain proper pressure in the tires. This should be checked at least once a month and should be done with the tires cold (not driven for one hour). If you check the tire pressure when the tires are warm, you will obtain a falsely high reading. Refer to the accompanying tire inflation chart, or to the sticker attached to the rear face of the right-hand door pillar (2-door models) or attached to the right rear hinge face (4-door models). Snow tires require a 4 psi cold increase in the rear tire pressure above that listed in the chart. For example, a 6.45 X 14 snow tire will require 30 psi to be properly inflated. Under no circumstances must the maximum inflation pressure, which is stamped on the sidewall of the tire, be exceeded. If you plan to do any trailer towing, it is recommended that tire pressure (cold) be increased by 6 psi on the rear wheels, again being careful not to exceed the maximum inflation pressure.

Tire Inflation Chart

Tire Size	*Front*	*Rear*
6.00 x 13 (1970 only)	24	26
6.45 x 14 †	24	26
B78 x 14, C78 x 14 #	24	26
D70 x 14	24	26
DR78 x 14	24	26
ER70 x 14 *	24	26
165 x 14, 175 x 14, 185 x 14 *	24	26

† 4-dr sdn with air cond. and 200 Six—27/29.

4-dr sdn without air cond. and 200 or 250 Six—26/28.

2-dr sdn with air cond. and 200 or 250 Six—26/28.

2-dr sdn without air cond. and 302 V8—26/28.

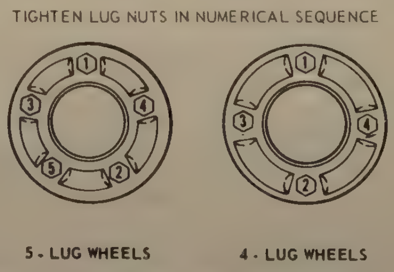
# 4-dr sdn with air cond. and 302 V8—26/28.

* With 250 and 302 engines only.

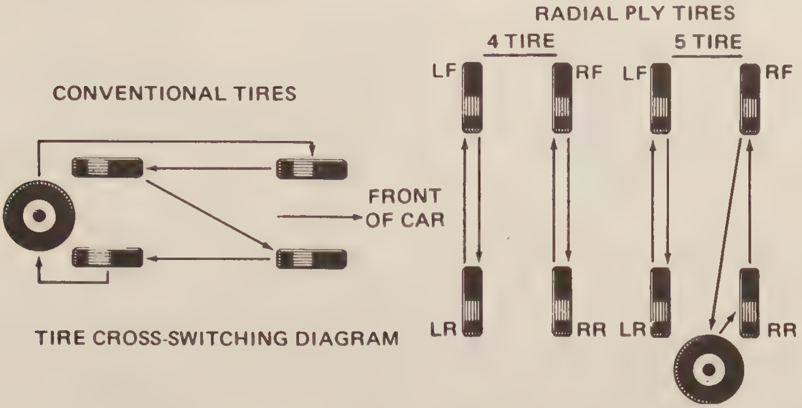
The above chart applies to "cold" pressure only. The tires are "cold" after being parked one hour or more or before the car is driven 3 miles.

Tire Rotation

Another way to prolong tire life is to rotate the tires at regular intervals. These intervals depend on the type of tire and on the type of driving you do, but generally they should be about 6,000 miles or twice a year, or sooner if abnormal wear due to front end misalignment is apparent. Follow the accompanying tire rotation diagram for the type of tires your car is equipped with; conventional (bias-ply or bias-belted) or radial-ply. Because of the design of radial-ply tires, it is imperative that they remain



Wheel Lug Nut Tightening Sequences



Tire Rotation Diagram

on the same side of the car and travel in the same direction. Therefore, in a 4-tire rotational sequence, the front and rear radial tires of the same side are merely swapped. Studded snow tires, radial or conventional, are just as choosy about the direction they travel in. If you equip your car with studded snow tires, mark them "LR" or "RR" prior to removal so that next year they may be installed on the same side of the car. If a studded snow tire that was used on the left rear wheel one year is installed on the right rear wheel the next year, the result will be a dangerous condition where the studs pull out of the tire and are flung to the rear. Remember, never mix radial, belted, and/or conventional type tires on your car. Always make sure that all tires and wheels are of the same size, type and load-carrying capacity.

NOTE: *If your Maverick or Comet is equipped with an optional "Space Saver Tire", do not include it during rotation of the other 4 tires. A 4-tire conventional type rotational diagram is a modified "X" pattern, with the LF becoming the RR, the RF becoming the LR, the LR becoming the LF, and the RR becoming the RF.*

FLUID LEVEL CHECKS

Engine Oil

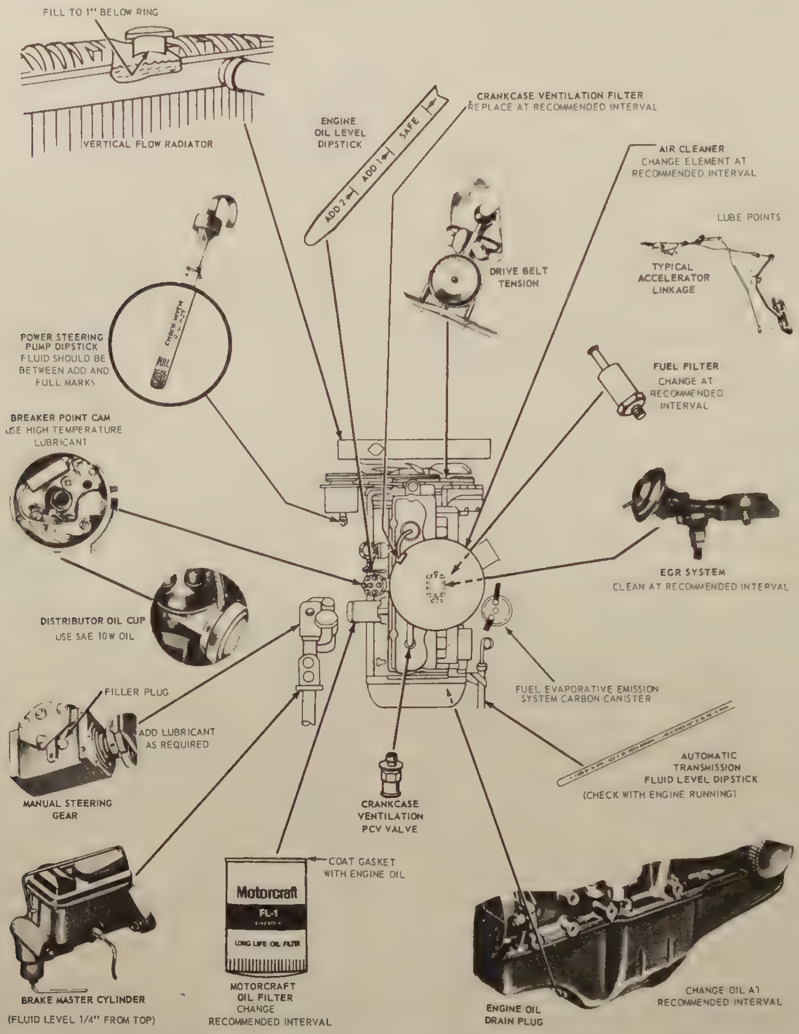
The oil level in the engine should be checked at fuel stops. The check should be made with the engine warm and switched off for a period of about one minute so that the oil has time to drain down into the crankcase. Pull out the dipstick, wipe it clean and reinsert it. The level of the oil must be kept within the "SAFE" area, above the "ADD 1" mark on the dipstick. If the oil level is kept above the "SAFE" area, heavy oil consumption will result. If the level remains below the "ADD 1" mark, severe engine damage may result. The "ADD 1" and "ADD 2" refer to US measure quarts. Remember that in Canada, the Imperial measure quart is used and it is equal to 5/4 of a US quart. When topping up, make sure that the oil is the same type and viscosity rating as the oil already in the crankcase.

Manual Transmission Fluid

At the recommended intervals in the maintenance schedule, the fluid level in the manual transmission should be checked. With the car standing perfectly level, apply the parking brake, set the transmission in Neutral, stop the engine and block all 4 wheels. Wipe all dirt and grease from the upper filler plug on the side of the transmission. Using a sliding T-bar handle or an adjustable wrench, remove the filler plug. The lubricant should be level with the bottom of the filler hole. If required, add SAE 90 manual transmission fluid to the proper level using a syringe. Install the filler plug.

Automatic Transmission Fluid

At the recommended intervals in the maintenance schedule, the automatic transmission fluid level should be checked. The level should also be checked if abnormal shifting behavior is noticed. With the car standing on a level surface, firmly apply the parking brake. Run the engine at idle until normal operating temperature is reached.


FILL TO 1" BELOW RING
VERTICAL FLOW RADIATOR
ENGINE OIL LEVEL DIPSTICK
ADD 2
ADD 1
SAFE
CRANKCASE VENTILATION FILTER REPLACE AT RECOMMENDED INTERVAL
AIR CLEANER CHANGE ELEMENT AT RECOMMENDED INTERVAL
LUBE POINTS
TYPICAL ACCELERATOR LINKAGE
DRIVE BELT TENSION
POWER STEERING PUMP DIPSTICK FLUID SHOULD BE BETWEEN ADD AND FULL MARKS
FULL
FUEL FILTER CHANGE AT RECOMMENDED INTERVAL
BREAKER POINT CAM USE HIGH TEMPERATURE LUBRICANT
EGR SYSTEM CLEAN AT RECOMMENDED INTERVAL
DISTRIBUTOR OIL CUP USE SAE 10W OIL
FILLER PLUG
ADD LUBRICANT AS REQUIRED
FUEL EVAPORATIVE EMISSION SYSTEM CARBON CANISTER
AUTOMATIC TRANSMISSION FLUID LEVEL DIPSTICK (CHECK WITH ENGINE RUNNING)
MANUAL STEERING GEAR
CRANKCASE VENTILATION PCV VALVE
COAT GASKET WITH ENGINE OIL
Motorcraft
FL-1
LONG LIFE OIL FILTER
BRAKE MASTER CYLINDER (FLUID LEVEL 1/4" FROM TOP)
MOTORCRAFT OIL FILTER CHANGE RECOMMENDED INTERVAL
ENGINE OIL DRAIN PLUG
CHANGE OIL AT RECOMMENDED INTERVAL

Six-Cylinder Engine Lubrication Rack Service Points

Then, with the right foot firmly planted on the brake pedal, shift the transmission selector through all of the positions, allowing sufficient time in each range to engage the transmission. Shift the selector into Park (P). With the engine still running, pull out the transmission dipstick, located at the right rear of the engine compartment. Wipe it clean and reinsert it, pushing it down until it seats in the tube. Pull it out and check the level. The level should be between the "ADD" and "FULL" marks. Add ATF Type F as required through the dipstick tube.

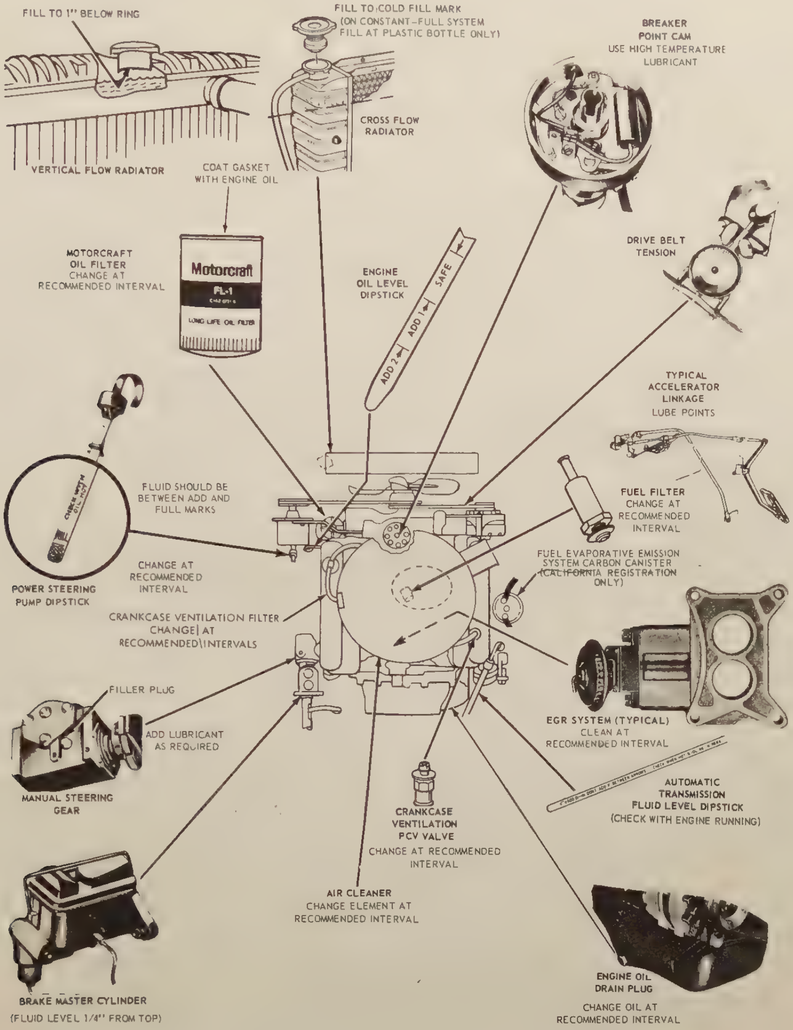
CAUTION: *Do not overfill the transmission, as foaming and loss of fluid through the vent may cause the transmission to malfunction.*

Brake Master Cylinder Fluid

At the recommended intervals in the maintenance schedule, the fluid in the master cylinder should be checked. Before checking the level, carefully wipe off the master cylinder cover to remove any dirt or water that would fall into the fluid reservoir. Then push the retaining clip to one side and remove the cover and seal. The fluid level should be maintained at ¼ in. from the top of the reservoir. Top up as necessary with heavy-duty brake fluid meeting SAE 70 R3 specifications.

Coolant

The coolant level in the radiator should be checked on a monthly basis, preferably


FILL TO 1" BELOW RING
VERTICAL FLOW RADIATOR
FILL TO COLD FILL MARK (ON CONSTANT–FULL SYSTEM FILL AT PLASTIC BOTTLE ONLY)
CROSS FLOW RADIATOR
BREAKER POINT CAM USE HIGH TEMPERATURE LUBRICANT
COAT GASKET WITH ENGINE OIL
MOTORCRAFT OIL FILTER CHANGE AT RECOMMENDED INTERVAL
Motorcraft FL-1 LONG LIFE OIL FILTER
ENGINE OIL LEVEL DIPSTICK
SAFE
ADD 1
ADD 2
DRIVE BELT TENSION
TYPICAL ACCELERATOR LINKAGE LUBE POINTS
FLUID SHOULD BE BETWEEN ADD AND FULL MARKS
FUEL FILTER CHANGE AT RECOMMENDED INTERVAL
POWER STEERING PUMP DIPSTICK
CHANGE AT RECOMMENDED INTERVAL
FUEL EVAPORATIVE EMISSION SYSTEM CARBON CANISTER (CALIFORNIA REGISTRATION ONLY)
CRANKCASE VENTILATION FILTER CHANGE AT RECOMMENDED INTERVALS
FILLER PLUG
ADD LUBRICANT AS REQUIRED
MANUAL STEERING GEAR
EGR SYSTEM (TYPICAL) CLEAN AT RECOMMENDED INTERVAL
AUTOMATIC TRANSMISSION FLUID LEVEL DIPSTICK (CHECK WITH ENGINE RUNNING)
CRANKCASE VENTILATION PCV VALVE
CHANGE AT RECOMMENDED INTERVAL
AIR CLEANER CHANGE ELEMENT AT RECOMMENDED INTERVAL
BRAKE MASTER CYLINDER (FLUID LEVEL 1/4" FROM TOP)
ENGINE OIL DRAIN PLUG
CHANGE OIL AT RECOMMENDED INTERVAL

V8 Engine Lubrication Rack Service Points

when the engine is cold. On a cold engine, the coolant level should be maintained at one inch below the filler neck on vertical flow radiators, and 2½ in. below the filler neck at the "COLD FILL" mark on cross-flow radiators. Top up as necessary with a mixture of 50% water and 50% ethylene glycol antifreeze, to ensure proper rust, freezing and boiling protection. If you have to add coolant more often than once a month or if you have to add more than one quart at a time, check the cooling system for leaks. Also check for water in the crankcase oil, indicating a blown cylinder head gasket.

CAUTION: *Exercise extreme care when removing the cap from a hot radiator. Wait a few minutes until the engine has time to cool somewhat, then wrap a thick towel around the radiator cap and slowly turn it counterclockwise to the first stop. Step back and allow the pressure to release from the cooling system. Then, when the steam has stopped venting, press down on the cap, turn it one more stop counterclockwise and remove the cap.*

Rear Axle Fluid

At the recommended intervals in the maintenance schedule, the rear axle fluid level should be checked. With the car standing perfectly level, apply the parking brake, set the transmission in Park or 1st gear, stop the engine and block all 4 wheels. Wipe all dirt and grease from the filler plug. Using a sliding T-bar handle (⅜ in.) or an adjustable wrench, remove the filler plug. On 1970–71 models, the fluid level must be maintained at ¼ in. from the bottom of the filler plug hole. On 1972 and later models, the proper level is ⅜ in. from the bottom of the filler plug hole. To check the fluid level in the axle, bend a clean, straight piece of wire to a 90° angle and insert the bent end of the wire into the axle while resting it on the lower edge of the filler hole. Top up as necessary with SAE 90 hypoid gear lube, using a syringe. Install the filler plug.

Steering Gear Lubricant

If there is binding in the steering gear or if the wheels do not return to a straight ahead position after a turn, the lubricant level of the steering gear should be checked. Remove the filler plug using a 1¹⁄₁₆ in. open end wrench and remove the lower cover bolt using a ⁹⁄₁₆ in. wrench, to expose both holes. Slowly turn the steering wheel to the left until it stops. At this point, lubricant should be rising in the lower cover bolt hole. Then slowly turn the steering wheel to the right until it stops. At this point, lubricant should be rising in the filler plug hole. If the lubricant does not rise when the wheel is turned, add a small amount of SAE 90 steering gear lubricant until it does. Replace the cover bolt and the filler plug when finished.

Power Steering Reservoir Fluid

At the recommended intervals in the maintenance schedule, the fluid level in the power steering reservoir (if so equipped) should be checked. Run the engine until the fluid reaches operating temperature. Turn the steering wheel from lock-to-lock several times to relieve the system of any trapped air. Turn off the engine. Unscrew the cap and dipstick assembly from the reservoir. The level must be maintained between the "FULL" mark and the end of the dipstick. Top up as necessary with ATF Type F.

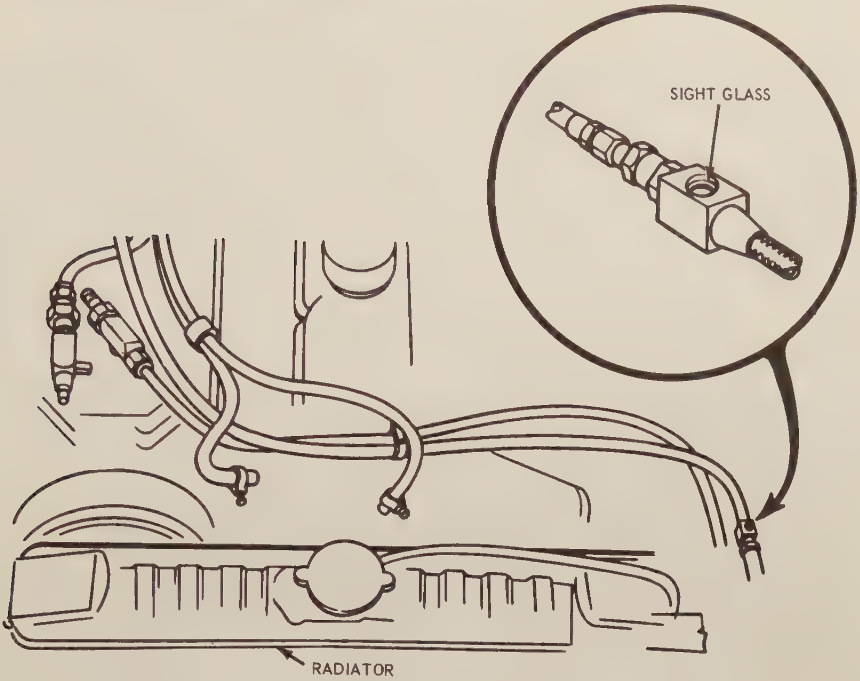
Battery Electrolyte

The fluid level in the battery cells should be checked on a monthly basis and more frequently in hot, dry weather. To top up the battery, ordinary tap water may be used except in areas known to have a high mineral or alkali content in the water. In these areas, distilled water must be used. The fluid level should be maintained at the "FILL TO RING" mark. If water is added during freezing weather, drive the car for several miles afterward to mix the water

Capacities

Year	Engine Displacement (cu in.)	Engine Crankcase (qts)		Transmission (pts)		Drive Axle (pts)	Gasoline Tank (gals)	Cooling System (qts)	
		With Filter	Without Filter	3-spd Manual	Automatic			w/o Air Cond.	with Air Cond.
1970	170, 200	4.5	3.5	3.5	16	2.5	16	9.0	9.0 ①
	250	4.5	3.5	—	18	2.5	16	10.0	10.0
1971	170, 200	4.5	3.5	3.5	16	2.5	15	9.0	9.0 ①
	250	4.5	3.5	3.5	18	2.5	15	9.5	9.5
	302	5.0	4.0	3.5	18	4.0	15	13.5	14.2
1972	170, 200	4.5	3.5	3.5	16	4.0	15	9.0	9.0 ①
	250	4.5	3.5	3.5	18	4.0	15	9.5	10.5
	302	5.0	4.0	3.5	18	4.0	15	13.5	14.2
1973	200	4.5	3.5	3.5	16	4.0	15	9.0	9.0
	250	4.5	3.5	3.5	18	4.0	15	9.7	9.7
	302	5.0	4.0	3.5	18	4.0	15	13.5	14.2
1974–76	200	5.0	4.0	3.5	16	4.0	15②	9.0	9.0
	250	5.0	4.0	3.5	18	4.0	15②	9.7	9.7
	302	5.0	4.0	3.5	18	4.0	15②	13.5	14.2

① 170 engines not available with air conditioning.
② 1975 models—16 U.S. gallons; 1976 models—19.2 U.S. gallons.



Air Conditioning Sight Glass

and the battery electrolyte. If water is needed frequently, check for a cracked battery case or a faulty voltage regulator or alternator.

CAUTION: *Keep lighted cigarettes or any other flame or spark away from the open battery cells. Highly combustible hydrogen gas is always present in the cells.*

Air Conditioning Refrigerant (if so equipped)

Once a year, before hot weather sets in, it is advisable to check the refrigerant charge in the air conditioner system. This may be accomplished by looking at the sight glass located in the engine compartment, next to the radiator. First, wipe the sight glass clean with a cloth wrapped around the eraser end of a pencil. Connect a tachometer to the engine with the positive line connected to the distributor side of the ignition coil and the negative line connected to a good ground, such as the steering box. Have a friend operate the air conditioner controls while you look at the sight glass. Have your friend set the dash panel control to maximum cooling. Start the engine and idle at 1,500 rpm. While looking at the sight glass, signal your friend to turn the blower switch to the High position. If a few bubbles appear immediately after the blower is turned on and then disappear, the system is sufficiently charged with refrigerant. If, on the other hand, a large amount of bubbles, foam or froth continue after the blower has operated for a few seconds, then the system is in need of additional refrigerant. If no bubbles appear at all, then there is either sufficient refrigerant in the system, or it is bone dry. The way to clear this question up is to have your friend turn the blower switch off and on (engine running at 1,500 rpm) about every 10 seconds or so while you look at the sight glass. This will cycle the magnetic clutch. If the system is properly charged, bubbles will appear in the sight glass a few seconds after the blower is turned off and disappear when the blower is turned on. If no bubbles appear when the blower is in the "OFF" position, then the system should be serviced by an authorized dealer and checked for leaks.

Lubrication

CHANGING ENGINE OIL AND FILTER

At the recommended intervals in the maintenance schedule, the oil and filter are changed. After the engine has reached operating temperature, shut it off, firmly apply the parking brake, block the wheels, place a drip pan beneath the oil pan and remove the drain plug. Allow the engine to drain thoroughly before replacing the drain plug. Place the drip pan beneath the oil filter. To remove the filter, turn it counterclockwise using a strap wrench. Wipe the contact surface of the new filter clean of all dirt and coat the rubber gasket with clean engine oil. Clean the mating surface of the adapter on the block. To install, hand turn the new filter clockwise until the gasket just contacts the cylinder block. Do not use a strap wrench to install. Then hand turn the filter ½ additional turn. Unscrew the filler cap on the valve cover and fill the crankcase to the proper level on the dipstick with the recommended grade of oil. Install the cap, start the engine and operate at fast idle. Check the oil filter contact area and the drain plug for leaks.

Certain operating conditions may warrant more frequent oil changes. If the vehicle is used for short trips, where the engine does not have a chance to fully warm-up before it is shut off, water condensation and low temperature deposits may make it necessary to change the oil sooner. If the vehicle is used mostly in stop-and-go traffic, corrosive acids and high temperature deposits may necessitate shorter oil changing intervals. The shorter intervals also apply to industrial or rural areas where high concentrations of dust and other airborne particulate matter contaminate the oil. Finally, if the car is used for towing trailers, a severe load is placed on the engine causing the oil to "thin-out" sooner, making necessary the shorter oil changing intervals.

CHASSIS GREASING

Front Suspension Ball Joints

At the recommended intervals, the upper and lower ball joints must be lubricated. Mavericks and Comets are not equipped with grease fittings at the ball joints. Instead, they use plugs, one at the top of the upper ball joint and another at the underside of the lower ball joint, which must be removed prior to greasing.

If you are using a jack to raise the front of the car, be sure to install jack stands, block the rear wheels and fully apply the parking brake. If the car has been parked in a temperature below 20°F for any length of time, park it in a heated garage for a half an hour or so until the ball joints loosen up enough to accept the grease. Wipe all accumulated dirt from around the ball joint lubrication plugs. Remove the plugs with a ³⁄₁₆ in. socket wrench. Using a hand-operated, low pressure grease gun fitted with a rubber tip and loaded with a suitable chassis grease, force lubricant into the joint only until the joint rubber boot begins to swell.

NOTE: *Do not force lubricant out of the rubber boot as this destroys the weather-tight seal.*

Install the grease plugs.

Steering Arm Stops

At the recommended intervals in the maintenance schedule, the steering arm stops must be cleaned and lubricated. The stops are located on the inside of the steering arm and the upturned end of the suspension strut where the strut is attached to the lower control arm. Clean all friction points and apply a suitable chassis grease as per the chassis lubrication diagram.

Power Steering Control Valve Ball Stud

On models equipped with power steering, the control valve ball stud (joint) must be lubricated every 3 years or 36,000 miles. Wipe the area around the grease plug clean of all dirt and foreign material. Remove the grease plug and install a grease fitting. Using a low pressure grease gun, apply a suitable chassis grease to the joint until the rubber boot begins to bulge. Any further lubrication will destroy the weathertight seal. Remove the grease fitting and install the plug.

Manual Transmission and Clutch Linkage

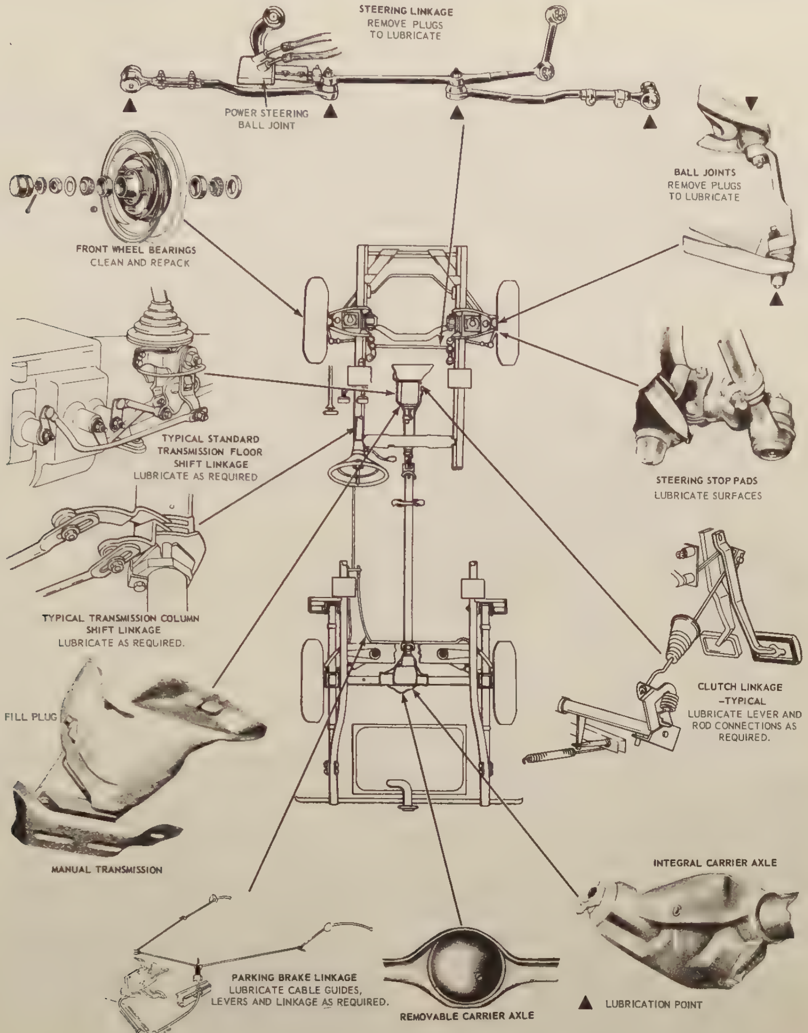
On models so equipped, apply a small amount of chassis grease to the pivot points of the transmission and clutch linkage as per the chassis lubrication diagram.

Automatic Transmission Linkage

On models so equipped, apply a small amount of 10W engine oil to the kickdown and shift linkage at the pivot points.

Parking Brake Linkage

At yearly intervals or whenever binding is noticeable in the parking brake linkage,


STEERING LINKAGE
REMOVE PLUGS
TO LUBRICATE
POWER STEERING
BALL JOINT
BALL JOINTS
REMOVE PLUGS
TO LUBRICATE
FRONT WHEEL BEARINGS
CLEAN AND REPACK
TYPICAL STANDARD
TRANSMISSION FLOOR
SHIFT LINKAGE
LUBRICATE AS REQUIRED
STEERING STOP PADS
LUBRICATE SURFACES
TYPICAL TRANSMISSION COLUMN
SHIFT LINKAGE
LUBRICATE AS REQUIRED.
CLUTCH LINKAGE
–TYPICAL
LUBRICATE LEVER AND
ROD CONNECTIONS AS
REQUIRED.
FILL PLUG
MANUAL TRANSMISSION
INTEGRAL CARRIER AXLE
PARKING BRAKE LINKAGE
LUBRICATE CABLE GUIDES,
LEVERS AND LINKAGE AS REQUIRED.
REMOVABLE CARRIER AXLE
▲ LUBRICATION POINT

Typical Chassis Lubrication Points

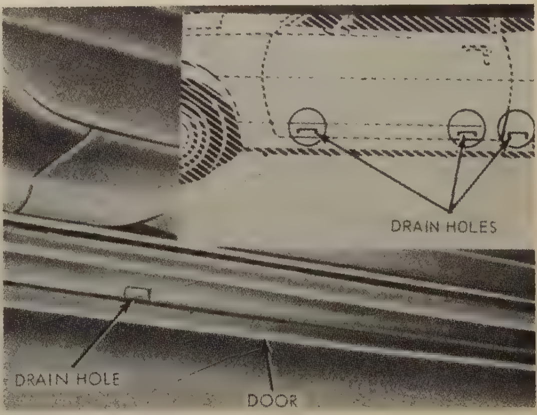
lubricate the cable guides, levers and linkage with a suitable chassis grease.

Body Lubrication

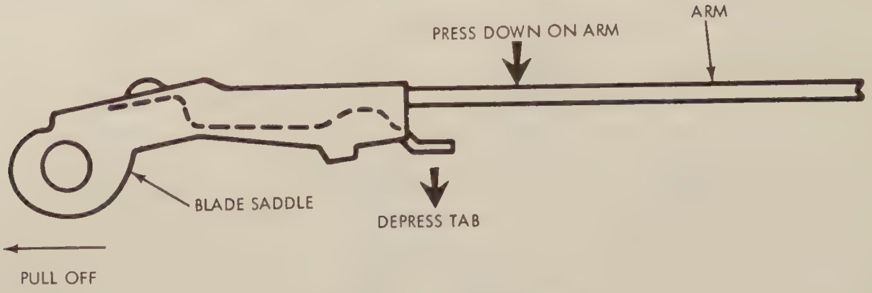
At the recommended intervals in the maintenance schedule, door, hood and trunk hinges, checks, and latches should be greased with a white grease such as Lubriplate®. Also the lock cylinders should be lubricated with a few drops of graphite lubricant.

Drain Hole Cleaning

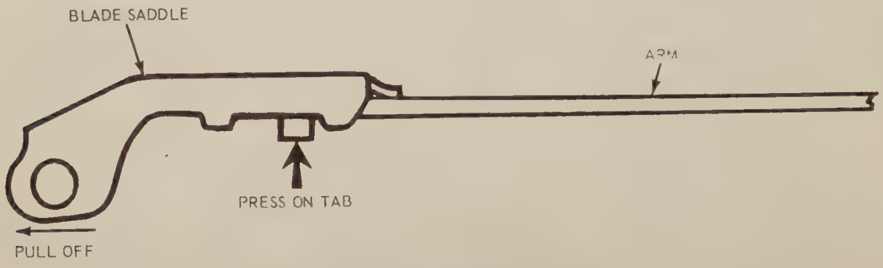
The doors and rocker panels of your car are equipped with drain holes to allow water to drain out of the inside of the body panels. If the drain holes become clogged with dirt, leaves, pine needles, etc., the water will remain inside the panels, causing rust. To prevent this, open the drain holes with a screwdriver. If your car is equipped with rubber dust valves instead, simply open the dust valve with your finger.


DRAIN HOLES
DRAIN HOLE
DOOR

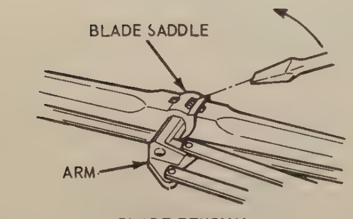
Body Drain Holes



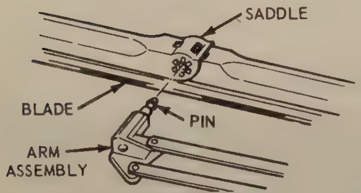
Trico Bayonet-Type Blade Removal



Anco Bayonet-Type Blade Removal



BLADE REMOVAL



BLADE INSTALLATION

Pin-Type Wiper Blade Replacement

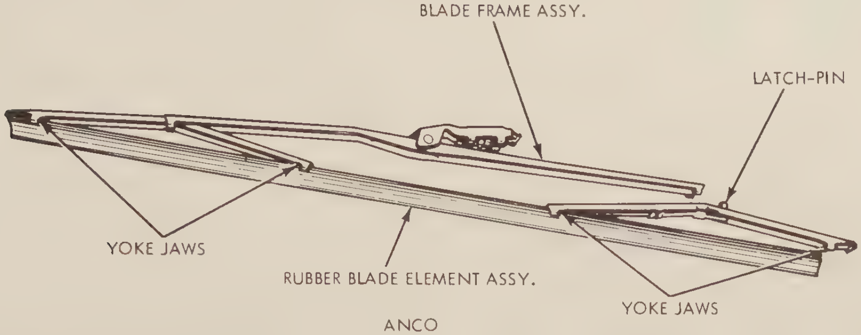
Wiper Blade Replacement

Depending on the type of weather, amount of use or the amount of snow removing chemicals used in your area, the recommended interval for replacement of wiper blades will vary. After making sure that the windshield glass surface is free of all oil, tree sap or other foreign substance that cannot be easily wiped off, check the wiper pattern for streaking. If the blades are cracked or the pattern is streaked or uneven, replace the blades. Replace any blade in question. It will be far cheaper than replacing a scratched windshield later.

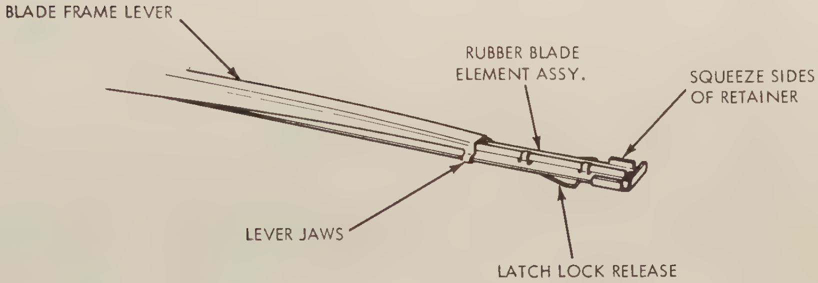
Pushing, Towing, and Jump Starting

Some day, when you least expect it, you will stroll out to your car, hop in, turn on the key and nothing will happen. At this point, your main interest will be in getting the engine started or repaired so that it will start in the future. If the car is in a reasonably good state of tune and you haven't flooded the engine, but the battery is dead or dying, the car may be jump started by means of jumper cables. All you need is a willing assistant with either a good 12 volt battery or a running engine with a 12 volt electrical system or both.

When using jumper cables to jump start a car, a few precautions must be taken to avoid both charging system damage and damage to yourself should the battery decide to explode. The old "positive to positive and negative to negative" jumper cable rule of thumb has been scrapped for a new revised procedure. Here it is. First, remove all of the battery cell covers and cover the cell openings with a clean, dry cloth. Then, connect the positive cable of the assist battery to the positive pole of your battery and the negative cable of the assist battery to the engine block of your car.

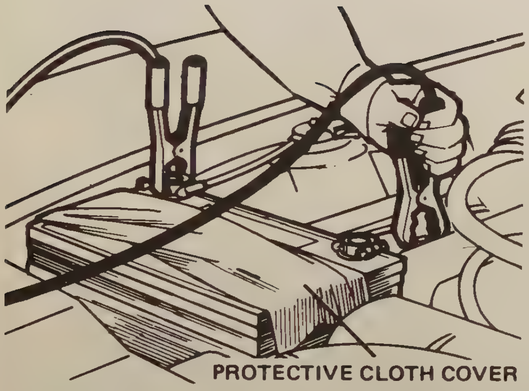


ANCO



TRICO

Replacing Rubber Insert



Jumper Cable Installation—Assisted Vehicle

This will prevent the possibility of a spark from the negative assist cable igniting the highly explosive hydrogen and oxygen battery fumes. Once your car is started, allow the engine to return to idle speed before disconnecting the jumper cables, and don't cross the cables. Replace the cell covers and discard the cloth.

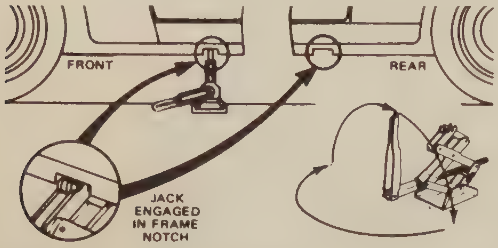
Now if your car fails to start by jump starting and it is equipped with manual transmission, it may be push started. Cars equipped with automatic transmission cannot be push started. If the bumper of the car pushing you and your car's bumper do not match perfectly, it is wise to tie an old tire either on the back of your car or on the front of the pushing car. This will avoid unnecessary trips to the body shop. To push start the car, switch the ignition to the "ON" position (not the "START" position) and depress the clutch pedal. Place the transmission in Third gear and hold the accelerator pedal about halfway down. When the car speed reaches about 10 mph, gradually release the clutch pedal and the engine should start.

If all else fails and the car must be towed to a garage, there are a few precautions that must be observed. If the transmission and rear axle are in proper working order, the car can be towed with the rear wheels on the ground for distances under 15 miles at speeds no greater than 30 mph. If the transmission or rear is known to be damaged or if the car has to be towed over 15 miles or over 30 mph, the car must be towed with the rear wheels raised and the steering wheel locked so that the front wheels remain in the straight-ahead position.

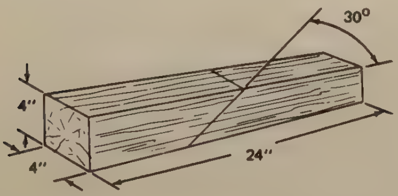
NOTE: *If the ignition key is not available to unlock the steering and transmission lock system, it will be necessary to dolly the car under the rear wheels with the front wheels raised.*

Jacking and Hoisting

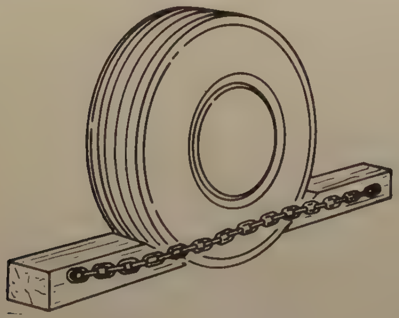
When it becomes necessary to raise the car for service, proper safety precautions must be taken. Mavericks and Comets are equipped with scissors jacks. These jacks are fine for changing a tire, but never crawl under the car when it is only supported by the scissors jack. If the jack should slip or tip over, as jacks often do, you would be pinned under 3,000 lbs. of automobile. When raising the car with the scissors jack to change a tire, follow these precautions. Fully apply the parking brake, block the wheel diagonally opposite the wheel to be raised, place the gear lever in Park (automatic) or 1st or Reverse gear (manual) and place the jack only at the points shown in the accompanying diagram, making sure that the jack is firmly planted on a level, solid surface. If you are going to work beneath the car, always install jack stands beneath the shaded areas shown in the frame contact area illustrations. When using a floor jack, the car may be raised at either front suspension lower control arm, front crossmember or at either side of the rear axle housing. Do not attempt to raise the car by the bumpers, as this will result in damage to the bumper attachments.


FRONT
REAR
JACK ENGAGED IN FRAME NOTCH

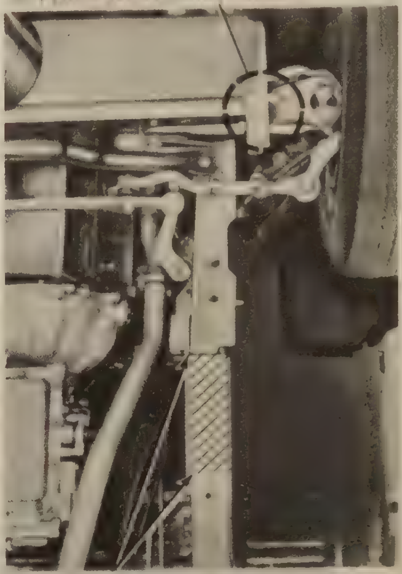
Scissors Jack Mounting Points



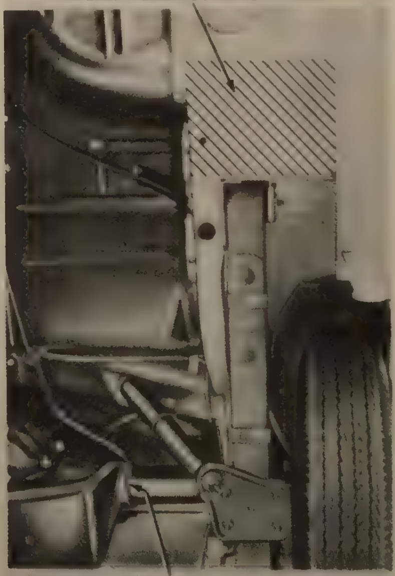
Cutting Wood for Wheel Blocks



Wheel Blocks Chained in Position


FRONT RAIL TYPE, FORK LIFT OR FLOOR JACK CONTACT AREA
FRONT FRAME CONTACT AREA

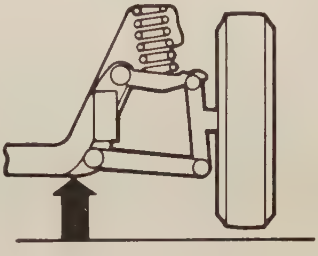
Front Hoist Contact Areas


REAR FRAME CONTACT AREA
REAR RAIL TYPE, FORK LIFT OR FLOOR JACK CONTACT AREA

Rear Hoist Contact Areas

The best way to raise a car for service is to use a garage hoist. There are several different types of garage hoists, each having their own special precautions. Types you most often will encounter are the drive-on (ramp type), frame contact and the twin post or rail type. When using a drive-on type, make sure that there is enough clearance between the upright flanges of the hoist rails and the underbody. When using a frame contact hoist, make sure that all 4 of the adapter pads are positioned in the center of the adapter contact areas (shaded area of hoist contact area illustrations). On unibody cars such as the Maverick and Comet, the shaded areas are reinforced steel box members (subframes). When using a twin-post or rail type, make sure that the front adapters are positioned squarely beneath the lower control arms and the rear adapters positioned carefully beneath the rear axle housing at points not further outboard than one inch from the circumference welds near the differential housing (to prevent shock absorber damage). Always raise the car slowly, observing the security of the hoist adapters as it is raised.

NOTE: *If it is desired to unload the front suspension ball joints for purposes of inspection, position the jack beneath the front crossmember, next to the lower control arm of the subject ball joints.*



Ball Joint Unloading

Tools and Equipment

Now that you have purchased this book and committed yourself to maintaining your car, a small set of basic tools and equipment will prove handy. The first group of items should be adequate for most maintenance and light repair procedures:

Sliding T-bar handle or ratchet wrench;
⅜ in. drive socket wrench set (with 12 in. breaker bar);
Universal adapter for socket wrench set;
Flat blade and phillips head screwdrivers;
Pliers;
Adjustable wrench;
Locking pliers;
Open-end wrench set;
Feeler gauge set;
Oil filter strap wrench;
Brake adjusting spoon;
Drift pin;
Torque wrench;
and, of course, a hammer.

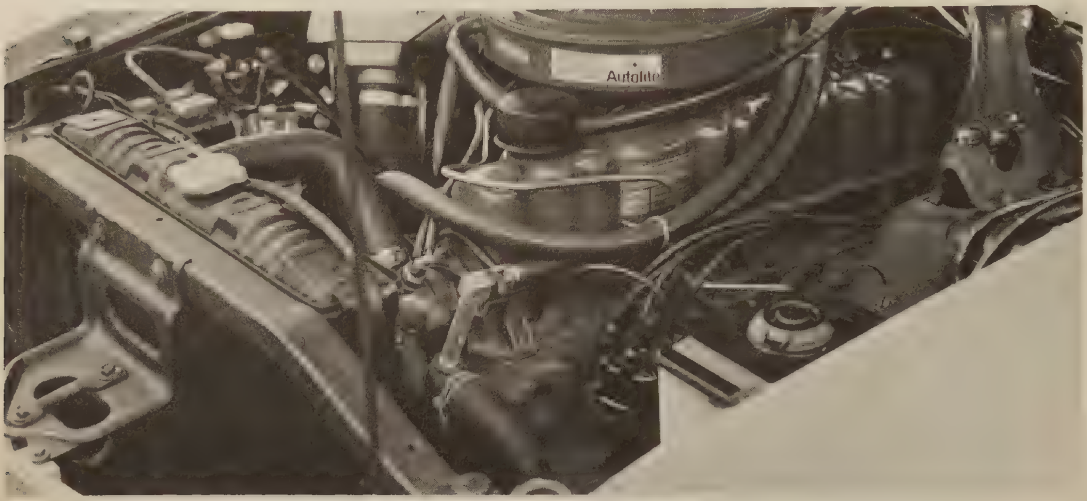
Along with the above mentioned tools, the following equipment should be on hand:

Scissors jack or hydraulic jack of sufficient capacity;
Jackstands of sufficient capacity;
Wheel blocks;
Grease gun (hand-operated type);
Drip pan (low and wide);
Drop light;
Tire pressure gauge;
Penetrating oil (spray lubricant);
and a can of waterless hand cleaner.

In this age of emission controls and high priced gasoline, it is important to keep your car in proper tune. The following items, though they will represent an investment equal or greater to that of the first group, will tell you everything you might need to know about a car's state of tune:

12-volt test light;
Compression gauge;
Manifold vacuum gauge;
Power timing light;
and a dwell-tachometer.

2 · Tune-Up and Troubleshooting



Tune-Up Procedures

The tune-up is a routine maintenance operation which is essential for the efficient and economical operation, as well as the long life of your car's engine. The interval between tune-ups is a variable factor which depends upon the way you drive your car, the conditions under which you drive it (weather, road type, etc.), and the type of engine installed in your car. It is generally correct to say that no car should be driven more than 12,000 miles between tune-ups, especially in this age of emission controls and fuel shortages. If you plan to drive your car extremely hard or under severe weather conditions, the tune-ups should be performed at closer intervals. High-performance engines require more frequent tuning than other engines, regardless of weather or driving conditions.

The replaceable parts involved in a tune-up include the spark plugs, breaker points, condenser (unless equipped with breakerless ignition), distributor cap, rotor, spark plug wires and the ignition coil high-tension (secondary) wire. In addition to these parts and the adjustments involved in properly adapting them to your engine, there are several adjustments of other parts involved in completing the job. These include carburetor idle speed and air/fuel mixture, ignition timing, and dwell angle (unless equipped with breakerless ignition).

This section gives specific procedures on how to tune-up your Maverick or Comet and is intended to be as complete and basic as possible. Later in this chapter, there is another, more generalized section for tune-ups that includes troubleshooting diagnosis for the more experienced weekend mechanic.

CAUTION: *When working with a running engine, make sure that there is proper ventilation. Also make sure that the transmission is in Neutral (unless otherwise specified) and the parking brake is fully applied. Always keep hands, long hair, clothing, neckties and tools well clear of the radiator fan. On a warm engine, keep clear of the hot exhaust manifold(s) and radiator. When the ignition is turned on and the engine running, do not grasp the ignition wires, distributor cap, or coil wire, as a shock in excess of 20,000 volts may result. Whenever working around the distributor, even if the engine is not running, make sure that the ignition is switched off.*

Tune-Up Specifications

When checking compression, take the highest reading and compare it to the lowest reading. The lowest reading must be within 75% of the highest.

Year	Engine No. Cyl Cu in. Displacement	Spark Plugs		Distributor		Ignition Timing (deg)		Intake Valve Opens (deg)	Fuel Pump Pressure (psi)	# Idle Speed (rpm)			
										MT		AT	
		Type	Gap (in.)	Point Dwell (deg)	Point Gap (in.)	MT	AT			with Solenoid	w/o Solenoid	with Solenoid	w/o Solenoid
1970	6–170	BF–82	0.032–0.036	35–40	0.027	6B	6B	9B	4–6	800/500	750 •	600/500	550 •
	6–200	BF–82	0.032–0.036	35–40	0.027	6B	6B	9B	4–6	800/500	750 •	600/500	550 •
	6–250	BF–82	0.032–0.036	37–42	0.025	—	6B	10B	4–6	—	—	600/500	550 •
1971	6–170	BRF–82	0.032–0.036	33–38	0.027	6B	—	9B	4–6	—	750	—	—
	6–200	BRF–82	0.032–0.036	33–38	0.027	6B	6B	9B	4–6	800/500	750 •	600/500	550 •
	6–250	BRF–82	0.032–0.036	34–39 ① 33–38 ②	0.025 ① 0.027 ②	6B	6B	10B	4–6	750/500	—	600/500	550 •
	8–302	BRF–42	0.032–0.036	24–29	0.021	6B	6B	16B	4–6	800/500	—	600/500	575 •
1972	6–170	BRF–82	0.032–0.036	35–39	0.027	6B	—	9B	4–6	—	750	—	—
	6–200	BRF–82	0.032–0.036	35–39	0.027	6B	6B	9B	4–6	800/500	750	600/500	550
	6–250	BRF–82	0.032–0.036	35–39	0.027	6B	6B	10B	4–6	750/500	—	600/500	550
	8–302	BRF–42	0.032–0.036	26–30	0.017	6B	6B	16B	5–7	800/500	—	600/500	575
1973	6-200	BRF–82	0.032–0.036	33–39	0.027	6B	6B	9B	4–6	800/500	—	600/500	—
	6-250	BRF–82	0.032–0.036	33–39	0.027	6B	6B	10B	4–6	750/500	—	600/500	—
	8-302	BRF–42	0.032–0.036	24–30	0.017	6B	6B	16B	5–7	800/500	—	650/500	—
1974 49 states	6-200	BRF–82	0.032–0.036	33–39	0.027	6B	6B	9B	4–6	800/500	—	600/500	—
	6-250	BRF–82	0.032–0.036	33–39	0.027	—	6B	10B	4–6	—	—	650/500	—
	8-302	BRF–42	0.032–0.036	24–30	0.017	10B	12B	16B	5–7	800/500	—	600/500	—
1974 California	6-250	BRF–82	0.042–0.046	Breakerless		6B	6B	10B	4–6	750/500	—	600/500	—
	8-302	BRF–42	0.052–0.056	Breakerless		6B	6B	16B	5–7	800/500	—	650/500	—
1975	6-200	BRF–82	0.044	Breakerless		6B	6B	28B	4–6	750/500	—	600/500	—
	6-250	BRF–82	0.044	Breakerless		6B	6B	26B	4–6	800/500	—	600/500	—
	8-302	ARF–42	0.044	Breakerless		6B	6B	20B	5–7	900/500	—	650/500	—
1976	6-200	BRF–82	0.044	Breakerless		10B	10B	20B	5–7	800/500	—	650/500	—
	6-250	BRF–82	0.044	Breakerless		6B③	14B③	18B	5–7	850/500	—	600/500	—
	8-302	ARF–82	0.044	Breakerless		12B	12B	16B	5–7	750/500	—	650/500	—

Idle speeds are adjusted with the headlights on, automatic transmission in Drive or manual transmission in Neutral, and the air conditioner controls (if so equipped) in the Off position. On models equipped with throttle solenoids, the high idle speed figure is adjusted with the solenoid activated, using the solenoid screw adjustment. The lower idle speed figure on solenoid-equipped cars is adjusted (with the solenoid wire disconnected at the inline connector) with the carburetor idle speed screws. On models not equipped with throttle solenoids (1970–72 models only), the idle speed is adjusted with the curb idle adjusting screw on the carburetor.

• Add 50 rpm if equipped with air conditioning.

① Single diaphragm distributor.

② Dual diaphragm distributor.

③ 8B with air conditioning.

SPARK PLUGS

The job of the spark plug is to ignite the air/fuel mixture in the cylinder as the piston approaches the top of the compression stroke. The ignited mixture then expands and forces the piston down on the power stroke. This turns the crankshaft which then turns the remainder of the drive train. If the transmission is in gear and the brakes are not applied, the vehicle will move.

The average life of a spark plug is approximately 12,000 miles. This is, however, dependent on the mechanical condition of the engine, the type of fuel that is used, and the type of driving conditions under which the car is used. For some people, spark plugs will last 5,000 miles and for others, 15,000 or 20,000 miles.

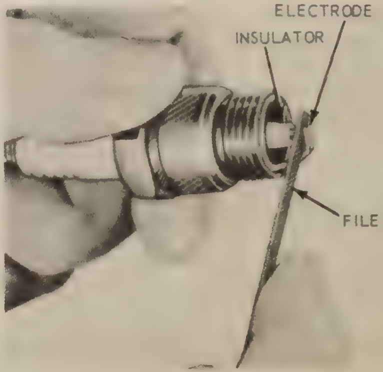
Your car came from the factory with resistor spark plugs. Resistor spark plugs help to limit the amount of radio frequency energy that is given off by the automotive ignition system. Radio frequency energy results in the annoying buzzing or clicking you sometimes hear on your radio or the jumping picture you see on your TV when a car pulls into the driveway.

The electrode end of the spark plug (the end that goes into the cylinder) is also a very good indicator of the mechanical condition of your engine. If a spark plug should foul and begin to misfire, you will have to find the condition that caused the plug to foul and correct it. It is also a good idea to occasionally give all the plugs the once-over to get an idea how the inside of your engine is doing. A small amount of deposit on a spark plug, after it has been in use for any period of time, should be considered normal.

Removal and Installation

Every six months or 6,000 miles, the spark plugs should be removed for inspection. At this time they should be cleaned and regapped. At 12-month or 12,000-mile intervals, the plugs should be replaced. However, on 1975–76 models equipped with electronic (breakerless) ignition, and running on unleaded fuel, plug life may be considerably longer.

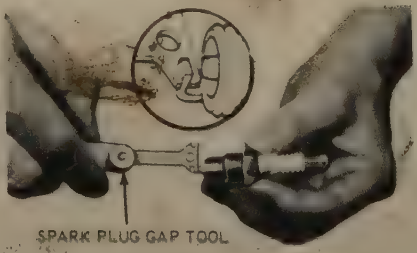
Prior to removal, number each spark plug wire with a piece of masking tape bearing the cylinder number. Remove each spark plug wire by grasping its rubber boot on the end and twisting slightly to free the wire from the plug. Using a $^{13}/_{16}$ in. spark plug socket, turn the plugs counterclockwise to remove them. Do not allow any foreign matter to enter the cylinders through the spark plug holes.



Cleaning Spark Plug Electrode

Consult the spark plug inspection chart in step 4.6 of the "Troubleshooting" section when in doubt about plug condition. If the spark plugs are to be reused, check the porcelain insulator for cracks and the electrodes for excessive wear. Replace the entire set if one plug is damaged. Clean the reusable plugs with a stiff wire brush, or have them cleaned in a plug sandblasting machine (found in many service stations). Uneven wear of the center or ground electrode may be corrected by leveling off the unevenly worn section with a file.

The gap must be checked with a feeler gauge before installing the plug in the engine. With the ground electrode positioned parallel to the center electrode, a wire gauge of the proper thickness must pass through the opening with a slight drag. If the air gap between the two electrodes is



Setting Spark Plug Gap

not correct, the ground electrode must be bent to bring it to specifications.

After the plugs are gapped correctly, they may be inserted into their holes and hand-tightened. Be careful not to cross-thread the plugs. Torque the plugs to the proper specification with a $1\frac{3}{16}$ in. socket and a torque wrench. Install each spark plug wire on its respective plug, making sure that each spark plug end is making good, metal-to-metal contact in its wire socket.

BREAKER POINTS AND CONDENSER

NOTE: *All 1975 and later models, as well as 1974 models sold in California, use a breakerless (solid state) ignition system. The breakerless system eliminates the breaker points and condenser completely. See "Ignition System" in Chapter 3 for a system description.*

The points and condenser function as a circuit breaker for the primary circuit of the ignition system. The ignition coil must boost the 12 volts (V) of electrical pressure supplied to it by the battery to about 20,000 V in order to fire the spark plugs. To do this, the coil depends on the points and condenser for assistance.

The coil has a primary and a secondary circuit. When the ignition key is turned to the "on" position, the battery supplies voltage to the primary side of the coil which passes the voltage on to the points. The points are connected to ground to complete the primary circuit. As the cam in the distributor turns, the points open and the primary circuit collapses. The magnetic force in the primary circuit of the coil cuts through the secondary circuit and increases the voltage in the secondary circuit to a level that is sufficient to fire the spark plugs. When the points open, the electrical charge contained in the primary circuit jumps the gap that is created between the two open contacts of the points. If this electrical charge was not transferred elsewhere, the material on the contacts of the points would melt and that all-important gap between the contacts would start to change. If this gap is not maintained, the points will not break the primary circuit. If the primary circuit is not broken, the secondary circuit will not have enough voltage to fire the spark plugs. Enter the condenser.

The function of the condenser is to absorb the excessive voltage from the points when they open and thus prevent the points from becoming pitted or burned.

There are two ways to check breaker point gap: with a feeler gauge or with a dwell meter. Either way you set the points, you are adjusting the amount of time (in degrees of distributor rotation) that the points will remain open. If you adjust the points with a feeler gauge, you are setting the maximum amount the points will open when the rubbing block on the points is on a high point of the distributor cam. When you adjust the points with a dwell meter, you are measuring the number of degrees (of distributor cam rotation) that the points will remain closed before they start to open as a high point of the distributor cam approaches the rubbing block of the points.

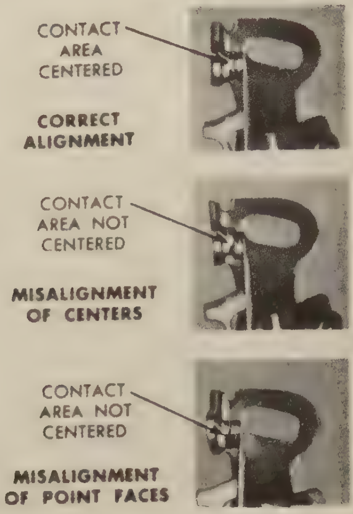
There are two rules that should always be followed when adjusting or replacing points. *The points and condenser are a matched set; never replace one without replacing the other. If you change the point gap or dwell of the engine, you also change the ignition timing. Therefore, if you adjust the points, you must also adjust the timing.*

Removal and Installation

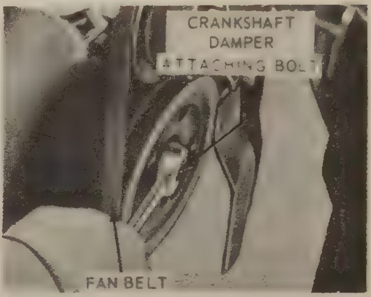
Disconnect the secondary cable from the coil at the center of the distributor. Using a screwdriver, pry the retaining clasps from either side of the distributor cap. Lift off the cap and position it to one side. Mark the position of the rotor by scribing a mark on the distributor housing. Pull the rotor straight up and off, and discard it if it is cracked, burned or excessively worn. Insert a screwdriver between the stationary and breaker arms of the points and examine the condition of the contacts. Replace the points if the contacts are blackened, pitted, or if the metal transfer exceeds that of the specified point gap (see Specifications). Also replace the points if the breaker arm has lost its tension or if the rubbing block has become worn or loose. Contact points that have become slightly burned (light gray) may be cleaned with a point file. In

BREAKER POINTS

Inspecting Breaker Points


CONTACT AREA CENTERED
CORRECT ALIGNMENT
CONTACT AREA NOT CENTERED
MISALIGNMENT OF CENTERS
CONTACT AREA NOT CENTERED
MISALIGNMENT OF POINT FACES

Breaker Point Alignment Guide


CRANKSHAFT DAMPER ATTACHING BOLT
FAN BELT

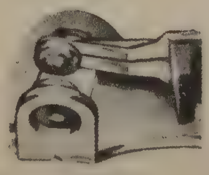
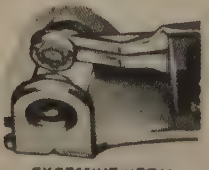
Manually Turning Over Engine

order for the points to function properly, the contact faces must be aligned. The alignment must be checked with the points closed. To close the points, install an open end wrench on the crakshaft pulley/damper bolt and turn the engine over by hand in a clockwise direction until the points can be seen to close.

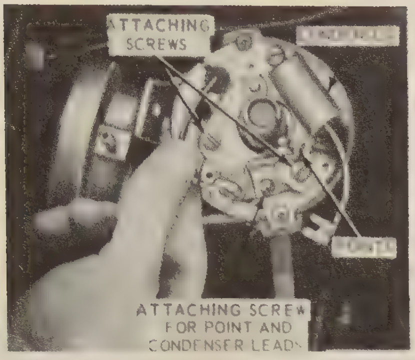
NOTE: *This may be more easily accomplished with the spark plugs removed.*

If the contact faces are not centered, bend the stationary arm to suit. Never bend the breaker arm. Discard the points if they cannot be centered correctly.

To replace the points and condenser, loosen the nut at the center of the point assembly and slide the distributor primary lead and the condenser lead away from the terminal. Then remove the condenser retaining screw and the two point assembly retaining screws and remove the points and condenser. While the points are out, lubricate the breaker cam with a very light coating of silicone based grease. Clean the distributor base plate with alcohol to remove any oil film that might impede completion of the ground circuit. Install the new points and condenser and tighten their

CONDITION	POSSIBLE CAUSE
 BURNED	INCORRECT VOLTAGE REGULATOR SETTING. RADIO CONDENSER INSTALLED TO THE DISTRIBUTOR SIDE OF THE COIL.
 EXCESSIVE METAL TRANSFER OR PITTING	INCORRECT ALIGNMENT. INCORRECT VOLTAGE REGULATOR SETTING. RADIO CONDENSER INSTALLED TO THE DISTRIBUTOR SIDE OF THE COIL. IGNITION CONDENSER OF IMPROPER CAPACITY. EXTENDED OPERATION OF THE ENGINE AT SPEEDS OTHER THAN NORMAL.

Breaker Point Inspection Guide


ATTACHING SCREWS
ATTACHING SCREW FOR POINT AND CONDENSER LEADS

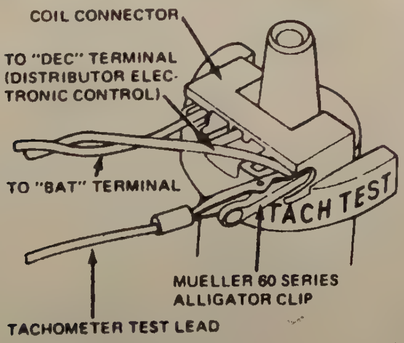
Disconnecting or Connecting Condenser Lead

retaining screws. Connect the electrical leads for both at the primary terminal. Make sure that the contacts are aligned horizontally and vertically as described previously.

The breaker points must be correctly gapped before proceeding any further. Install an open end wrench on the crankshaft pulley/damper bolt and turn the engine over by hand in a clockwise direction until the rubbing block on the point assembly is resting on the high point of a breaker cam lobe. Loosen the point retaining (attaching) screws slightly. Insert a feeler gauge of the proper thickness between the point contacts (see Specifications). The gap is correct when the loosely held feeler gauge passes through the contacts with a slight drag. Insert the tip of a screwdriver in the notch beside the points and twist to open or close the point gap as necessary. Then, without disturbing the setting, tighten the two breaker point retaining screws. Recheck the gap after tightening.

FEELER GAUGE
BREAKER POINTS

Checking Breaker Point Gap


COIL CONNECTOR
TO "DEC" TERMINAL (DISTRIBUTOR ELECTRONIC CONTROL)
TO "BAT" TERMINAL
TACH TEST
MUELLER 60 SERIES ALLIGATOR CLIP
TACHOMETER TEST LEAD

Attaching Dwell/Tachometer Lead to Coil Connector—1975–76 Models

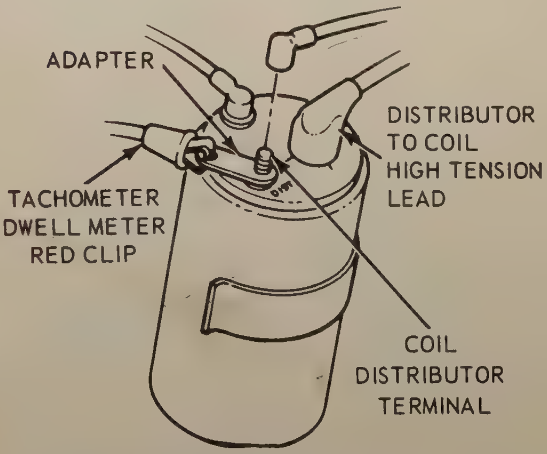
If a dwell meter is available, proceed to "Dwell Angle Setting." If the meter is not available, proceed to replace the rotor on top of the distributor shaft, making sure that the tab inside the rotor aligns with the slot on the distributor shaft. Position the distributor cap on top of the distributor and snap the cap clasps onto the slots in the cap. Check that the cap is fully seated and that the spark plug wires fit snugly into the cap. Connect the secondary cable from the coil at the distributor. Proceed to "Ignition Timing Adjustment."

DWELL ANGLE SETTING

NOTE: *On cars equipped with breakerless (solid state) ignition, dwell is electronically controlled and cannot be adjusted.*

The dwell angle is the number of degrees of distributor cam rotation through which the breaker points remain fully closed (conducting electricity). Increasing the point gap decreases dwell, while decreasing the point gap increases dwell.

Using a dwell meter of known accuracy, connect the red lead (positive) wire of the meter to the distributor primary wire connection on the positive (+) side of the coil, and the black ground (negative) wire of the meter to a good ground on the engine (e.g. thermostat housing nut).


ADAPTER
DISTRIBUTOR TO COIL HIGH TENSION LEAD
TACHOMETER DWELL METER RED CLIP
COIL DISTRIBUTOR TERMINAL

Installing Dwell Meter Adapter on Coil

The dwell angle may be checked either with the distributor cap and rotor installed and the engine running, or with the cap and rotor removed and the engine cranking at starter speed. The meter gives a constant reading with the engine running. With the engine cranking, the reading will fluctuate between zero degrees dwell and the maximum figure for that angle. While cranking, the maximum figure is the correct one for that setting. Never attempt to change dwell angle while the ignition is on. Touching the point contacts or primary wire connection with a metal screwdriver may result in a 12 volt shock.

To change the dwell angle, loosen the point retaining screw slightly and make the approximate correction. Tighten the retaining screw and test the dwell with the engine cranking. If the dwell appears to be correct, install the breaker point protective cover, if so equipped, the rotor and distributor cap, and test the dwell with the engine running. Take the engine through its entire rpm range and observe the dwell meter. The dwell should remain within specifications at all times. Great fluctuation of dwell at different engine speeds indicates worn distributor parts.

Following the dwell angle adjustment, the ignition timing must be checked. A 1° increase in dwell results in the ignition timing being retarded 2° and vice versa.

IGNITION TIMING

NOTE: *On cars equipped with breakerless (solid state), regular ignition timing adjustments are not necessary, as there are no points to wear out.*

Ignition timing is the measurement in degrees of crankshaft rotation of the instant the spark plugs in the cylinders fire, in relation to the location of the piston, while the piston is on its compression stroke.

Ideally, the air/fuel mixture in the cylinder will be ignited (by the spark plug) and just beginning its rapid expansion as the piston passes top dead center (TDC) of the compression stroke. If this happens, the piston will be beginning the power stroke just as the compressed (by the movement of the piston) and ignited (by the spark plug) air/fuel mixture starts to expand. The expansion of the air/fuel mixture will then force the piston down on the power stroke and turn the crankshaft.

It takes a fraction of a second for the spark from the plug to completely ignite the mixture in the cylinder. Because of this, the spark plug must fire before the piston reaches TDC, if the mixture is to be completely ignited as the piston passes TDC. This measurement is given in degrees (of crankshaft rotation) *before* the piston reaches *top dead center* (BTDC). If the ignition timing setting for your engine is six degrees (6°) BTDC, this means that the spark plug must fire at a time when the piston for that cylinder is 6° before top dead center of its compression stroke. However, this only holds true while your engine is at idle speed.

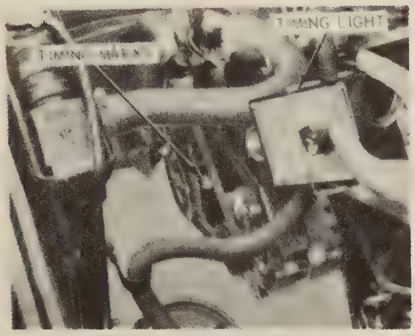
As you accelerate from idle, the speed of your engine (rpm) increases. The increase is rpm means that the pistons are now traveling up and down much faster. Because of this, the spark plugs will have to fire even sooner if the mixture is to be completely ignited as the piston passes TDC. To accomplish this, the distributor incorporates means to advance the timing of the spark as engine speed increases.

The distributor in your car has two means of advancing the ignition timing. One is called centrifugal advance and is actuated by weights in the distributor. The other is called vacuum advance and is controlled by that large circular housing on the side of the distributor.

In addition, some distributors have a vacuum-retard mechanism which is contained in the same housing on the side of the distributor as the vacuum advance. The function of the mechanism is to retard the timing of the ignition spark under certain engine conditions. This causes more complete burning of the air/fuel mixture in the cylinder and consequently lowers exhaust emissions.

Because these mechanisms change ignition timing, it is necessary to disconnect and plug the one or two vacuum lines from the distributor when setting the basic ignition timing.

If ignition timing is set too far advanced (BTDC), the ignition and expansion of the air/fuel mixture in the cylinder will try to force the piston down the cylinder while it is still traveling upward. This causes engine "ping," a sound which resembles mar-



Timing Light Aimed at Timing Marks

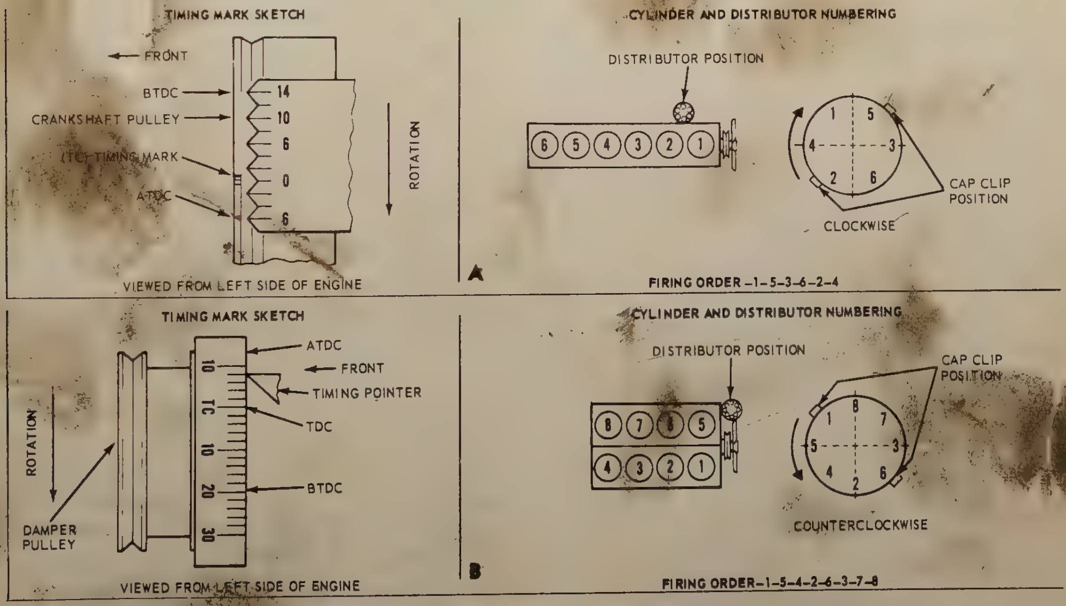
bles being dropped into an empty tin can. If the ignition timing is too far retarded (after, or ATDC), the piston will have already started down on the power stroke when the air/fuel mixture ignites and expands. This will cause the piston to be forced down only a portion of its travel. This will result in poor engine performance and lack of power.

Ignition timing adjustment is checked with a timing light. This instrument is connected to the number one (no. 1) spark plug of the engine. The timing light flashes every time an electrical current is sent from the distributor, through the no. 1 spark plug wire, to the spark plug. The crankshaft pulley and the front cover of the engine are marked with a timing pointer and a timing scale. When the timing pointer is aligned with the "0" mark on the timing scale, the piston in no. 1 cylinder is at TDC of its compression stroke. With the engine running, and the timing light aimed at the timing pointer and timing scale, the stroboscopic flashes from the timing light will allow you to check the ignition timing setting of the engine. The timing light flashes every time the spark plug in the no. 1 cylinder of the engine fires. Since the flash from the timing light makes the crankshaft pulley seem stationary for a moment, you will be able to read the exact position of the piston in the no. 1 cylinder on the timing scale on the front of the engine.

Ignition Timing Adjustment

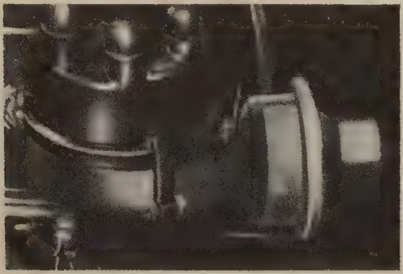
On conventional ignition cars, the ignition timing is checked every 12 months or 12,000 miles. The timing adjustment should always follow a breaker point gap and/or dwell angle adjustment and be made with the engine at operating temperature.

Clean the crankshaft damper/pulley and timing pointer on the water pump housing with a solvent soaked rag or a wire brush so that the marks can be seen. Connect a stroboscopic timing light to the no. 1 cylinder spark plug (see firing order illustration) and to the battery, according to the manufacturer's instructions. Scribe a mark on the crankshaft damper/pulley and on the pointer with chalk or luminescent (day glo) paint to highlight the correct timing setting. Disconnect the vacuum hose


TIMING MARK SKETCH
FRONT
BTDC
CRANKSHAFT PULLEY
(TC) TIMING MARK
ATDC
14
10
6
0
6
ROTATION
VIEWED FROM LEFT SIDE OF ENGINE
A
CYLINDER AND DISTRIBUTOR NUMBERING
DISTRIBUTOR POSITION
6 5 4 3 2 1
1 5 4 3 2 6
CAP CLIP POSITION
CLOCKWISE
FIRING ORDER –1–5–3–6–2–4
TIMING MARK SKETCH
ATDC
FRONT
TIMING POINTER
TDC
BTDC
10
TC
10
20
30
ROTATION
DAMPER PULLEY
VIEWED FROM LEFT SIDE OF ENGINE
B
CYLINDER AND DISTRIBUTOR NUMBERING
DISTRIBUTOR POSITION
8 7 6 5
4 3 2 1
CAP CLIP POSITION
8 1 7 5 3 4 6 2
COUNTERCLOCKWISE
FIRING ORDER–1–5–4–2–6–3–7–8

Engine Timing and Cylinder Firing Order—A. 170, 200, and 250 6-cylinder; B. 302 V8 at the distributor vacuum capsule and plug it (them) with a pencil, golf tee, or some other small pointed object.

Attach a tachometer to the engine. On 1970–74 models equipped with conventional ignition, attach one lead to the distributor primary wire connection at the coil and the other lead to a good ground. On 1974 California models and all 1975–76 models equipped with breakerless ignition, connect one lead to the "TACH TEST" connection atop the ignition coil (see illustration) and the other wire to a good ground. Make sure all wires clear the fan. Set the idle speed to specifications using the idle speed adjusting screws. With the engine running, aim the timing light at the pointer and the marks on the damper/pulley. If the marks made with the chalk or paint coincide when the timing light flashes, the engine is timed correctly. If the marks do not coincide, stop the engine. Loosen the distributor locknut and start the engine again. While observing the timing light flashes on the markers, grasp the distributor vacuum capsule—not the distributor cap—and rotate the distributor until the marks do coincide. Stop the engine and tighten the distributor locknut, taking care not to disturb the setting. As a final check, start the engine once more to make sure that the timing marks align.



Distributor Locknut

NOTE: *If necessary, readjust idle speed to specifications. The timing setting is correct only at idle speed.*

Reconnect the vacuum hoses to the distributor. Readjust the curb idle speed to specifications as outlined under "Idle Speed and Mixture Adjustment." Remove the timing light and tachometer from the engine.

CARBURETOR

This section contains only carburetor adjustments as they normally apply to engine tune-up. Descriptions of the carburetor and complete adjustment procedures can be found in Chapter Four.

When the engine in your car is running, air/fuel mixture from the carburetor is being drawn into the engine by a partial vacuum that is created by the downward movement of the piston on the intake stroke of the four-stroke cycle of the engine. The amount of air/fuel mixture that enters the engine is controlled by throttle plate(s) in the bottom of the carburetor. When the engine is not running, the throttle plate(s) is (are) closed, completely blocking off the bottom of the carburetor from the inside of the engine. The throttle plates are connected, through the throttle linkage, to the gas pedal in the passenger compartment of the car. After you start the engine and put the transmission in gear, you depress the gas pedal to start the car moving. What you actually are doing when you depress the gas pedal is opening the throttle plate in the carburetor to admit more of the air/fuel mixture to the engine. The further you open the throttle plates in the carburetor, the higher the engine speed becomes.

As previously stated, when the engine is not running, the throttle plates in the carburetor are closed. When the engine is idling, it is necessary to open the throttle plates slightly. To prevent having to keep your foot on the gas pedal when the engine is idling, an idle speed adjusting screw was added to the carburetor. This screw has the same effect as keeping your foot slightly depressed on the gas pedal. The idle speed adjusting screw contacts a lever (the throttle lever) on the outside of the carburetor. When the screw is turned in, it opens the throttle plate on the carburetor, raising the idle speed of the engine. This screw is called the curb idle adjusting screw, and the procedures in this section will tell you how to adjust it.

In addition to the curb idle adjusting screw, all 1973 and later engines as well as many 1972 and earlier engines also have a throttle solenoid. Ford Motor Company has found it necessary to raise the idle speed on these engines to obtain a smooth engine idle. When the key is turned to "off," the current to the spark plugs is cut off and the engine normally stops running. However, if an engine has a high operating temperature, and a high idle speed, it is possible for the temperature of the cylinder instead of the spark plug to ignite the air/fuel mixture. When this happens, the engine continues to run after the key is turned off. To solve this problem, a throttle solenoid was added to the carburetor. The solenoid is a cylinder with an adjustable plunger and an electrical lead. When the ignition key is turned to "on," the solenoid plunger extends to contact the carburetor throttle lever and raise the idle speed of the engine. When the ignition key is turned to "off," the solenoid is de-energized and the solenoid plunger falls back from the throttle lever. This allows the throttle lever to fall back and rest on the curb idle adjusting screw. This drops the engine idle speed back far enough that the engine will not run on.

Since it is difficult for the engine to draw the air/fuel mixture from the carburetor with the small amount of throttle plate opening that is present when the engine is idling, an idle mixture passage is provided in the carburetor. This passage delivers air/fuel mixture to the engine from a hole which is located in the bottom of the carburetor below the throttle plates. This idle mixture passage contains an adjusting screw which restricts the amount of air/fuel mixture that enters the engine at idle. The procedures given in this section will tell how to set the idle mixture adjusting screw(s).

NOTE: *With the electric solenoid disengaged, the carburetor idle speed adjusting screw must make contact with the throttle lever to prevent the throttle plates from jamming in the throttle bore when the engine is turned off.*

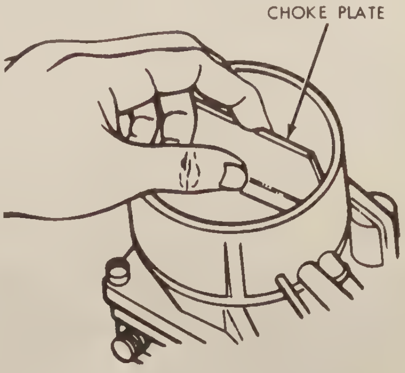
Idle Speed and Mixture Adjustments

NOTE: *In order to limit exhaust emissions, plastic caps have been installed on the idle fuel mixture screw(s) that prevent the carburetor from being adjusted to an overly rich idle fuel mixture. Under no circumstances should these limiters be modified or removed. A satisfactory idle may be obtained within the range of the limiter(s).*

Carter YF, Carter RBS,
Autolite (Motorcraft) 2100D,
and Motorcraft 2150

1. Start the engine and run it at idle until it reaches operating temperature (about 20 min., depending on outside temperature).

2. Firmly apply the parking brake. Place blocks in front of and in back of all 4 wheels. Remove the air cleaner. Make sure that the carburetor choke plate is in the fully open position (plate in vertical position). Install the air cleaner.

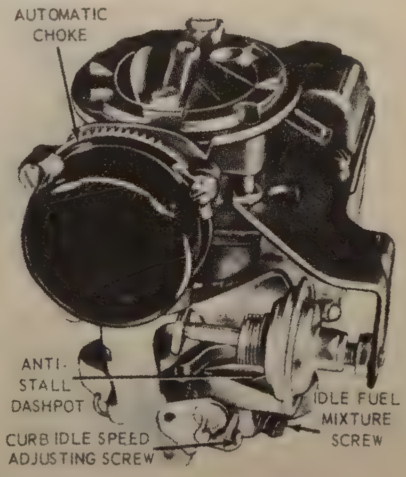


Choke Plate in Full Open Position

3. Check the ignition timing as outlined under "Ignition Timing Adjustment." Attach a tachometer to the engine.

4. Idle speed adjustments are made with the headlights on on 1970–72 cars and with the headlights off on 1973–76 cars, with the air conditioning turned off (if so equipped), with the air cleaner on, with the automatic transmission in Drive (Neutral for lower idle speed on solenoid-equipped cars) or with the manual transmission in Neutral.

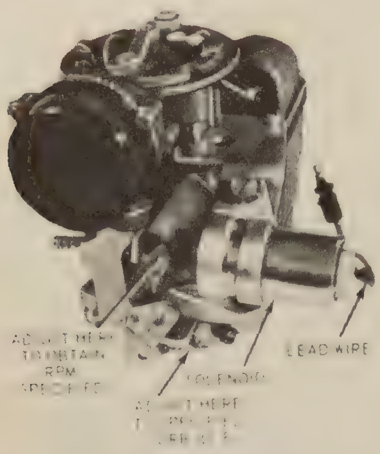
5. On cars equipped with a throttle solenoid, the higher idle speed figure is adjusted with the solenoid activated (plugged in). On 1971 302 V8 engines equipped



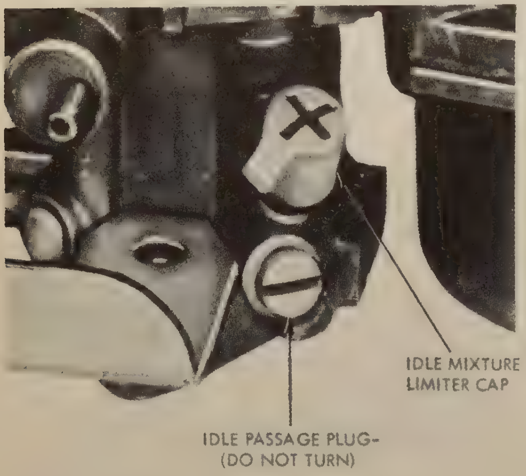
Carter YF Adjustments

with a throttle solenoid, the adjustment is made by turning the entire solenoid assembly in or out of its bracket and then tightening the locknut. On 1972 and later 302 V8 models, the solenoid adjustment is made by turning the solenoid adjusting screw in or out and then tightening the locknut. All six-cylinder models are adjusted by merely turning the solenoid adjusting screw in or out (there is no locknut).

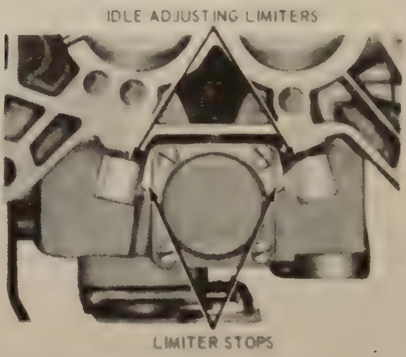
6. On cars equipped with a throttle solenoid, the lower idle speed is adjusted with the solenoid deactivated (unplugged at the harness). Disconnect the solenoid lead at the connector near the harness (not at the carburetor). On cars equipped with automatic transmission, adjust the lower idle speed with the selector in Neutral. The adjustment is made with the curb


ADJUST HERE
TO OBTAIN
RPM
SPECIFIED
LEAD WIRE
SOLENOID
ADJUST HERE
SPECIFIED

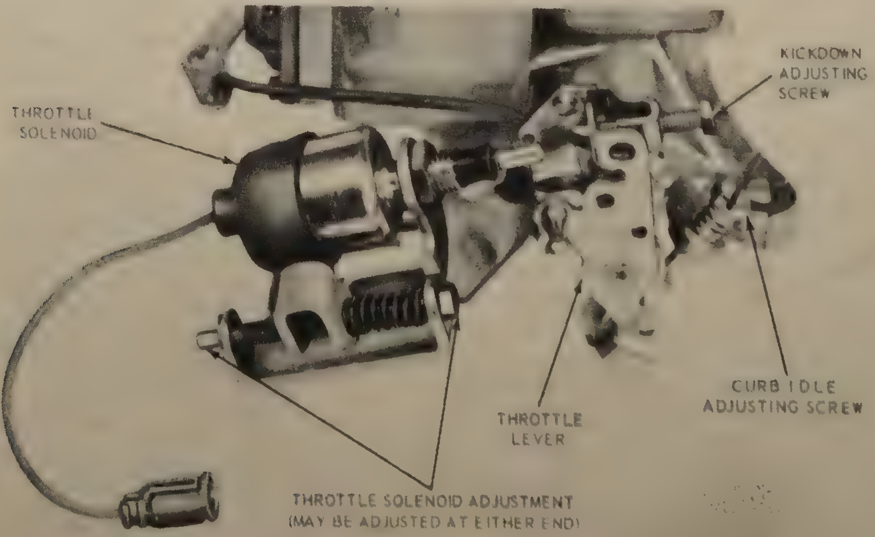
Carter YF with Solenoid Throttle Positioner


IDLE MIXTURE
LIMITER CAP
IDLE PASSAGE PLUG-
(DO NOT TURN)

Carter RBS Adjustments


IDLE ADJUSTING LIMITERS
LIMITER STOPS

Motorcraft (Autolite) 2100-D, 2150 Idle Adjusting Limiters and Limiter Stops (Bottom View)


THROTTLE
SOLENOID
KICKDOWN
ADJUSTING
SCREW
CURB IDLE
ADJUSTING SCREW
THROTTLE
LEVER
THROTTLE SOLENOID ADJUSTMENT
(MAY BE ADJUSTED AT EITHER END)

Motorcraft (Autolite) 2100-D, 2150 with Solenoid Throttle Positioner idle adjusting screw on the carburetor. After adjusting the lower idle speed, reconnect the solenoid lead at the harness connector and open the throttle slightly by hand, allowing the solenoid plunger to extend.

7. On cars not equipped with a throttle solenoid, turn the curb idle screw inward or outward until the correct idle rpm is reached.

NOTE: *It it becomes impossible to adjust the idle speed with the air cleaner installed, remove the air cleaner and make the approximate adjustment, reinstall the air cleaner and check the idle speed. Continued with this trial and error method until the proper idle speed is attained.*

8. Turn the idle mixture adjusting screw(s) inward to obtain the smoothest idle possible within the range of the idle limiter(s).

CATALYTIC CONVERTER PRECAUTIONS

Many 1975 and all 1976 models are equipped with a catalytic converter to clean up exhaust emissions after they leave the engine. On these models, lead-free fuel must be used exclusively in order to prevent the converter from being coated with lead particles, rendering it ineffective. However, there are many other precautions which should be taken to prevent a large amount of unburned hydrocarbons from reaching the converter. Should a sufficient amount of HC reach the converter, the unit could overheat, possibly damaging the converter, nearby mechanical components, or cause a fire hazard. Therefore, when working on your car, the following conditions should be avoided:

1. The use of fuel system cleaning agents and additives.
2. Operating the car with an inoperative (closed) choke, or submerged carburetor float.
3. Extended periods of engine run-on (dieseling).
4. Turning off the ignition with the car in motion.
5. Ignition or charging system failure.
6. Misfiring of one or more spark plugs.
7. Disconnecting a spark plug wire while testing for bad wire, plug, or poor compression in one cylinder.
8. Push or tow-starting the car, especially when hot.
9. Pumping the gas pedal when attempting to start a hot engine.

Engine Tune-Up

Engine tune-up is a procedure performed to restore engine performance, deteriorated due to normal wear and loss of adjustment. The three major areas considered in a routine tune-up are compression, ignition, and carburetion, although valve adjustment may be included.

A tune-up is performed in three steps: *analysis*, in which it is determined whether normal wear is responsible for performance loss, and which parts require replacement or service; *parts replacement or service*; and *adjustment*, in which engine adjustments are returned to original specifications. Since the advent of emission control equipment, precision adjustment has become increasingly critical, in order to maintain pollutant emission levels.

Analysis

The procedures below are used to indicate where adjustments, parts service or replacement are necessary within the realm of a normal tune-up. If, following these tests, all systems appear to be functioning properly, proceed to the Troubleshooting Section for further diagnosis.

—Remove all spark plugs, noting the cylinder in which they were installed. Remove the air cleaner, and position the throttle and choke in the full open position. Disconnect the coil high tension lead from the coil and the distributor cap. Insert a compression gauge into the spark plug port of each cylinder, in succession, and crank the engine with the starter to obtain the highest possible reading. Record the readings, and compare the highest to the lowest on the compression pressure limit chart. If the difference exceeds the limits on the chart, or if all readings are excessively low, proceed to a wet compression check (see Troubleshooting Section).

Maxi. Press. Lbs. Sq. In.	*Min. Press. Lbs. Sq. In.*	*Max. Press. Lbs. Sq. In.*	*Min. Press. Lbs. Sq. In.*
134	101	188	141
136	102	190	142
138	104	192	144
140	105	194	145
142	107	196	147
146	110	198	148
148	111	200	150
150	113	202	151
152	114	204	153
154	115	206	154
156	117	208	156
158	118	210	157
160	120	212	158
162	121	214	160
164	123	216	162
166	124	218	163
168	126	220	165
170	127	222	166
172	129	224	168
174	131	226	169
176	132	228	171
178	133	230	172
180	135	232	174
182	136	234	175
184	138	236	177
186	140	238	178

Compression pressure limits
(© Buick Div. G.M. Corp.)

—Evaluate the spark plugs according to the spark plug chart in the Troubleshooting Section, and proceed as indicated in the chart.

—Remove the distributor cap, and inspect it inside and out for cracks and/or carbon tracks, and inside for excessive wear or burning of the rotor contacts. If any of these faults are evident, the cap must be replaced.

—Check the breaker points for burning, pitting or wear, and the contact heel resting on the distributor cam for excessive wear. If defects are noted, replace the entire breaker point set.

—Remove and inspect the rotor. If the contacts are burned or worn, or if the rotor is excessively loose on the distributor shaft (where applicable), the rotor must be replaced.

—Inspect the spark plug leads and the coil high tension lead for cracks or brittleness. If any of the wires appear defective, the entire set should be replaced.

—Check the air filter to ensure that it is functioning properly.

Parts Replacement and Service

The determination of whether to replace or service parts is at the mechanic's discretion; however, it is suggested that any parts in questionable condition be replaced rather than reused.

—Clean and regap, or replace, the spark plugs as needed. Lightly coat the threads with engine oil and install the plugs. CAUTION: *Do not over-torque taper-seat spark plugs, or plugs being installed in aluminum cylinder heads.*

SPARK PLUG TORQUE

Thread size	*Cast-Iron Heads*	*Aluminum Heads*
10 mm.	14	11
14 mm.	30	27
18 mm.	34*	32
⅞ in.—18	37	35

* 17 ft. lbs. for tapered plugs using no gaskets.

—If the distributor cap is to be reused, clean the inside with a dry rag, and remove corrosion from the rotor contact points with fine emery cloth. Remove the spark plug wires one by one, and clean the wire ends and the inside of the towers. If the boots are loose, they should be replaced.

If the cap is to be replaced, transfer the wires one by one, cleaning the wire ends and replacing the boots if necessary.

—If the original points are to remain in service, clean them lightly with emery cloth, lubricate the contact heel with grease specifically designed for this purpose. Rotate the crankshaft until the heel rests on a high point of the distributor cam, and adjust the point gap to specifications.

When replacing the points, remove the original points and condenser, and wipe out the inside of the distributor housing with a clean, dry rag. Lightly lubricate the contact heel and pivot point, and install the points and condenser. Rotate the crankshaft until the heel rests on a high point of the distributor cam, and adjust the point gap to specifications. NOTE: *Always replace the condenser when changing the points.*

—If the rotor is to be reused, clean the contacts with solvent. Do not alter the spring tension of the rotor center contact. Install the rotor and the distributor cap.

—Replace the coil high tension lead and/or the spark plug leads as necessary.

—Clean the carburetor using a spray solvent (e.g., Gumout Spray). Remove the varnish from the throttle bores, and clean the linkage. Disconnect and plug the fuel line, and run the engine until it runs out of fuel. Partially fill the float chamber with solvent, and reconnect the fuel line. In extreme cases, the jets can be pressure flushed by inserting a rubber plug into the float vent, running the spray nozzle through it, and spraying the solvent until it squirts out of the venturi fuel dump.

—Clean and tighten all wiring connections in the primary electrical circuit.

Additional Services

The following services *should* be performed in conjunction with a routine tune-up to ensure efficient performance.

—Inspect the battery and fill to the proper level with distilled water. Remove the cable clamps, clean clamps and posts thoroughly, coat the posts lightly with petroleum jelly, reinstall and tighten.

—Inspect all belts, replace and/or adjust as necessary.

—Test the PCV valve (if so equipped), and clean or replace as indicated. Clean all crankcase ventilation hoses, or replace if cracked or hardened.

—Adjust the valves (if necessary) to manufacturer's specifications.

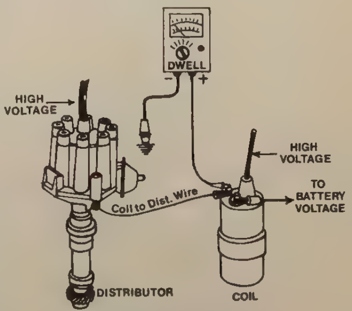
Adjustments

—Connect a dwell-tachometer between the distributor primary lead and ground. Remove the distributor cap and rotor (unless equipped with Delco externally adjustable distributor). With the ignition off, crank the engine with a remote starter switch and measure the point dwell angle. Adjust the dwell angle to specifications. NOTE: *Increasing the gap decreases the dwell angle and vice-versa.* Install the rotor and distributor cap.

—Connect a timing light according to the manufacturer's specifications. Identify the proper timing marks with chalk or paint. NOTE: *Luminescent (day-glo) paint is excellent for this purpose.* Start the engine, and run it until it reaches operating temperature. Disconnect and plug any distributor vacuum lines, and adjust idle to the speed required to adjust timing, according to specifications. Loosen the distributor clamp and adjust timing to specifications by rotating the distributor in the engine. NOTE: *To advance timing, rotate distributor opposite normal direction of rotor rotation, and vice-versa.*

—Synchronize the throttles and mixture of multiple carburetors (if so equipped) according to procedures given in the individual car sections.

—Adjust the idle speed, mixture, and idle quality, as specified in the car sections. Final idle adjustments should be made with the air cleaner installed. CAUTION: *Due to strict emission control requirements on 1969 and later models, special test equipment (CO meter, SUN Tester) may be necessary to properly adjust idle mixture to specifications.*



Dwell meter hook-up

Trouble-shooting

The following section is designed to aid in the rapid diagnosis of engine problems. The systematic format is used to diagnose problems ranging from engine starting difficulties to the need for engine overhaul. It is assumed that the user is equipped with basic hand tools and test equipment (tach-dwell meter, timing light, voltmeter, and ohmmeter).

Troubleshooting is divided into two sections. The first, *General Diagnosis*, is used to locate the problem area. In the second, *Specific Diagnosis*, the problem is systematically evaluated.

General Diagnosis

PROBLEM: Symptom	*Begin diagnosis at Section Two, Number ———*
Engine won't start:	
Starter doesn't turn	1.1, 2.1
Starter turns, engine doesn't	2.1
Starter turns engine very slowly	1.1, 2.4
Starter turns engine normally	3.1, 4.1
Starter turns engine very quickly	6.1
Engine fires intermittently	4.1
Engine fires consistently	5.1, 6.1
Engine runs poorly:	
Hard starting	3.1, 4.1, 5.1, 8.1
Rough idle	4.1, 5.1, 8.1
Stalling	3.1, 4.1, 5.1, 8.1
Engine dies at high speeds	4.1, 5.1
Hesitation (on acceleration from standing stop)	5.1, 8.1
Poor pickup	4.1, 5.1, 8.1
Lack of power	3.1, 4.1, 5.1, 8.1
Backfire through the carburetor	4.1, 8.1, 9.1
Backfire through the exhaust	4.1, 8.1, 9.1
Blue exhaust gases	6.1, 7.1
Black exhaust gases	5.1
Running on (after the ignition is shut off)	3.1, 8.1
Susceptible to moisture	4.1
Engine misfires under load	4.1, 7.1, 8.4, 9.1
Engine misfires at speed	4.1, 8.4
Engine misfires at idle	3.1, 4.1, 5.1, 7.1, 8.4

PROBLEM: Symptom	*Probable Cause*
Engine noises: ①	
Metallic grind while starting	Starter drive not engaging completely
Constant grind or rumble	*Starter drive not releasing, worn main bearings
Constant knock	Worn connecting rod bearings
Knock under load	Fuel octane too low, worn connecting rod bearings
Double knock	Loose piston pin
Metallic tap	*Collapsed or sticky valve lifter, excessive valve clearance, excessive end play in a rotating shaft
Scrape	*Fan belt contacting a stationary surface
Tick while starting	S.U. electric fuel pump (normal), starter brushes
Constant tick	*Generator brushes, shreaded fan belt
Squeal	*Improperly tensioned fan belt
Hiss or roar	*Steam escaping through a leak in the cooling system or the radiator overflow vent
Whistle	*Vacuum leak
Wheeze	Loose or cracked spark plug

①—It is extremely difficult to evaluate vehicle noises. While the above are general definitions of engine noises, those starred (*) should be considered as possibly originating elsewhere in the car. To aid diagnosis, the following list considers other potential sources of these sounds.

Metallic grind:
  Throwout bearing; transmission gears, bearings, or synchronizers; differential bearings, gears; something metallic in contact with brake drum or disc.
Metallic tap:
  U-joints; fan-to-radiator (or shroud) contact.
Scrape:
  Brake shoe or pad dragging; tire to body contact; suspension contacting undercarriage or exhaust; something non-metallic contacting brake shoe or drum.
Tick:
  Transmission gears; differential gears; lack of radio suppression; resonant vibration of body panels; windshield wiper motor or transmission; heater motor and blower.
Squeal:
  Brake shoe or pad not fully releasing; tires (excessive wear, uneven wear, improper inflation); front or rear wheel alignment (most commonly due to improper toe-in).
Hiss or whistle:
  Wind leaks (body or window); heater motor and blower fan.
Roar:
  Wheel bearings; wind leaks (body and window).

Specific Diagnosis

This section is arranged so that following each test, instructions are given to proceed to another, until a problem is diagnosed.

INDEX

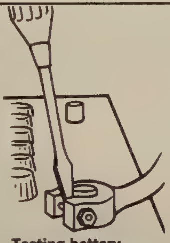
Group		*Topic*
1	*	Battery
2	*	Cranking system
3	*	Primary electrical system
4	*	Secondary electrical system
5	*	Fuel system
6	*	Engine compression
7	**	Engine vacuum
8	**	Secondary electrical system
9	**	Valve train
10	**	Exhaust system
11	**	Cooling system
12	**	Engine lubrication

*—The engine need not be running.
**—The engine must be running.

SAMPLE SECTION

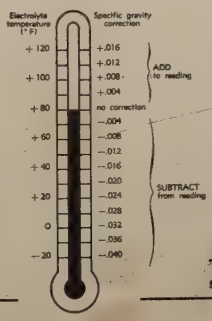
Test and Procedure	*Results and Indications*	*Proceed to*
4.1—Check for spark: Hold each spark plug wire approximately ¼″ from ground with gloves or a heavy, dry rag. Crank the engine and observe the spark.	→ If no spark is evident: →	4.2
	→ If spark is good in some cases: →	4.3
	→ If spark is good in all cases: →	4.6

DIAGNOSIS

1.1—Inspect the battery visually for case condition (corrosion, cracks) and water level.	If case is cracked, replace battery:	1.4
	If the case is intact, remove corrosion with a solution of baking soda and water (CAUTION: *do not get the solution into the battery*), and fill with water:	1.2
1.2—Check the battery cable connections: Insert a screwdriver between the battery post and the cable clamp. Turn the headlights on high beam, and observe them as the screwdriver is gently twisted to ensure good metal to metal contact.  **Testing battery cable connections using a screwdriver**	If the lights brighten, remove and clean the clamp and post; coat the post with petroleum jelly, install and tighten the clamp:	1.4
	If no improvement is noted:	1.3
1.3—Test the state of charge of the battery using an individual cell tester or hydrometer.	If indicated, charge the battery. NOTE: *If no obvious reason exists for the low state of charge (i.e., battery age, prolonged storage), the charging system should be tested:*	1.4

Spec. Grav. Reading	*Charged Condition*
1.260-1.280	Fully Charged
1.230-1.250	Three Quarter Charged
1.200-1.220	One Half Charged
1.170-1.190	One Quarter Charged
1.140-1.160	Just About Flat
1.110-1.130	All The Way Down

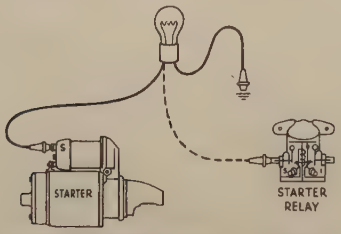
State of battery charge

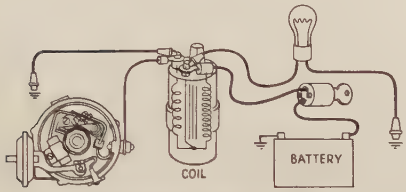
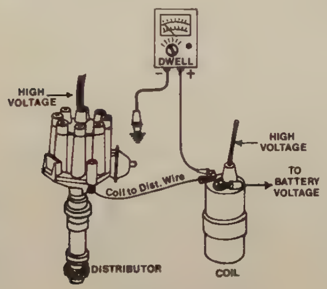
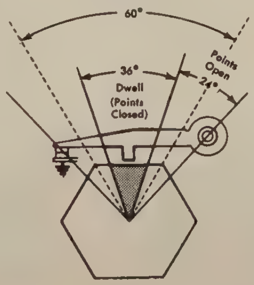
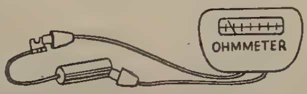


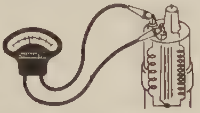
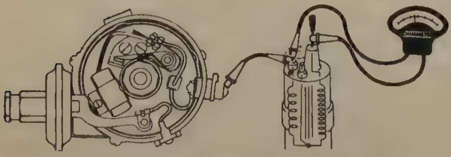
The effect of temperature on the specific gravity of battery electrolyte

Test and Procedure	*Results and Indications*	*Proceed to*
1.4—Visually inspect battery cables for cracking, bad connection to ground, or bad connection to starter.	If necessary, tighten connections or replace the cables:	2.1

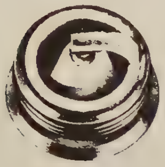
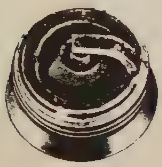
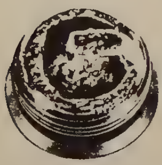
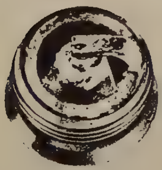
Tests in Group 2 are performed with coil high tension lead disconnected to prevent accidental starting.

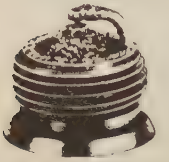
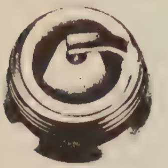
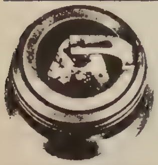
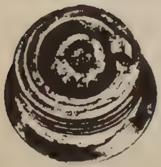
Test and Procedure	*Results and Indications*	*Proceed to*
2.1—Test the starter motor and solenoid: Connect a jumper from the battery post of the solenoid (or relay) to the starter post of the solenoid (or relay).	If starter turns the engine normally:	2.2
	If the starter buzzes, or turns the engine very slowly:	2.4
	If no response, replace the solenoid (or relay).	3.1
	If the starter turns, but the engine doesn't, ensure that the flywheel ring gear is intact. If the gear is undamaged, replace the starter drive.	3.1
2.2—Determine whether ignition override switches are functioning properly (clutch start switch, neutral safety switch), by connecting a jumper across the switch(es), and turning the ignition switch to "start".	If starter operates, adjust or replace switch:	3.1
	If the starter doesn't operate:	2.3
2.3—Check the ignition switch "start" position: Connect a 12V test lamp between the starter post of the solenoid (or relay) and ground. Turn the ignition switch to the "start" position, and jiggle the key.  Checking the ignition switch "start" position	If the lamp doesn't light when the switch is turned, check the ignition switch for loose connections, cracked insulation, or broken wires. Repair or replace as necessary:	3.1
	If the lamp flickers when the key is jiggled, replace the ignition switch.	3.3
2.4—Remove and bench test the starter, according to specifications in the car section.	If the starter does not meet specifications, repair or replace as needed:	3.1
	If the starter is operating properly:	2.5
2.5—Determine whether the engine can turn freely: Remove the spark plugs, and check for water in the cylinders. Check for water on the dipstick, or oil in the radiator. Attempt to turn the engine using an 18″ flex drive and socket on the crankshaft pulley nut or bolt.	If the engine will turn freely only with the spark plugs out, and hydrostatic lock (water in the cylinders) is ruled out, check valve timing:	9.2
	If engine will not turn freely, and it is known that the clutch and transmission are free, the engine must be disassembled for further evaluation:	Next Chapter

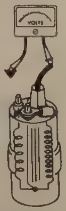
Tests and Procedures	*Results and Indications*	*Proceed to*
3.1—Check the ignition switch "on" position: Connect a jumper wire between the distributor side of the coil and ground, and a 12V test lamp between the switch side of the coil and ground. Remove the high tension lead from the coil. Turn the ignition switch on and jiggle the key.  Checking the ignition switch "on" position	If the lamp lights: If the lamp flickers when the key is jiggled, replace the ignition switch: If the lamp doesn't light, check for loose or open connections. If none are found, remove the ignition switch and check for continuity. If the switch is faulty, replace it:	3.2 3.3 3.3
3.2—Check the ballast resistor or resistance wire for an open circuit, using an ohmmeter.	Replace the resistor or the resistance wire if the resistance is zero.	3.3
3.3—Visually inspect the breaker points for burning, pitting, or excessive wear. Gray coloring of the point contact surfaces is normal. Rotate the crankshaft until the contact heel rests on a high point of the distributor cam, and adjust the point gap to specifications.	If the breaker points are intact, clean the contact surfaces with fine emery cloth, and adjust the point gap to specifications. If pitted or worn, replace the points and condenser, and adjust the gap to specifications: NOTE: *Always lubricate the distributor cam according to manufacturer's recommendations when servicing the breaker points.*	3.4
3.4—Connect a dwell meter between the distributor primary lead and ground. Crank the engine and observe the point dwell angle.  DWELL HIGH VOLTAGE HIGH VOLTAGE TO BATTERY VOLTAGE Coil to Dist. Wire DISTRIBUTOR COIL Dwell meter hook-up	If necessary, adjust the point dwell angle: NOTE: *Increasing the point gap decreases the dwell angle, and vice-versa.* If dwell meter shows little or no reading:  Dwell angle	3.6 3.5
3.5—Check the condenser for short: Connect an ohmmeter across the condenser body and the pigtail lead. Checking the condenser for short  	If any reading other than infinite resistance is noted, replace the condenser:	3.6

Test and Procedure	*Results and Indications*	*Proceed to*
3.6—Test the coil primary resistance: Connect an ohmmeter across the coil primary terminals, and read the resistance on the low scale. Note whether an external ballast resistor or resistance wire is utilized.  **Testing the coil primary resistance**	Coils utilizing ballast resistors or resistance wires should have approximately 1.0Ω resistance; coils with internal resistors should have approximately 4.0Ω resistance. If values far from the above are noted, replace the coil:	4.1
4.1—Check for spark: Hold each spark plug wire approximately ¼″ from ground with gloves or a heavy, dry rag. Crank the engine, and observe the spark.	If no spark is evident: If spark is good in some cylinders: If spark is good in all cylinders:	4.2 4.3 4.6
4.2—Check for spark at the coil high tension lead: Remove the coil high tension lead from the distributor and position it approximately ¼″ from ground. Crank the engine and observe spark. CAUTION: *This test should not be performed on cars equipped with transistorized ignition.*	If the spark is good and consistent: If the spark is good but intermittent, test the primary electrical system starting at 3.3: If the spark is weak or non-existent, replace the coil high tension lead, clean and tighten all connections and retest. If no improvement is noted:	4.3 3.3 4.4
4.3—Visually inspect the distributor cap and rotor for burned or corroded contacts, cracks, carbon tracks, or moisture. Also check the fit of the rotor on the distributor shaft (where applicable).	If moisture is present, dry thoroughly, and retest per 4.1: If burned or excessively corroded contacts, cracks, or carbon tracks are noted, replace the defective part(s) and retest per 4.1: If the rotor and cap appear intact, or are only slightly corroded, clean the contacts thoroughly (including the cap towers and spark plug wire ends) and retest per 4.1: If the spark is good in all cases: If the spark is poor in all cases:	4.1 4.1 4.6 4.5
4.4—Check the coil secondary resistance: Connect an ohmmeter across the distributor side of the coil and the coil tower. Read the resistance on the high scale of the ohmmeter.  **Testing the coil secondary resistance**	The resistance of a satisfactory coil should be between 4KΩ and 10KΩ. If the resistance is considerably higher (i.e., 40KΩ) replace the coil, and retest per 4.1: NOTE: *This does not apply to high performance coils.*	4.1

Test and Procedure	*Results and Indications*	*Proceed to*
4.5—Visually inspect the spark plug wires for cracking or brittleness. Ensure that no two wires are positioned so as to cause induction firing (adjacent and parallel). Remove each wire, one by one, and check resistance with an ohmmeter.	Replace any cracked or brittle wires. If any of the wires are defective, replace the entire set. Replace any wires with excessive resistance (over 8000Ω per foot for suppression wire), and separate any wires that might cause induction firing.	4.6
4.6—Remove the spark plugs, noting the cylinders from which they were removed, and evaluate according to the chart below.	See below.	See below.

	Condition	*Cause*	*Remedy*	*Proceed to*
	Electrodes eroded, light brown deposits.	Normal wear. Normal wear is indicated by approximately .001″ wear per 1000 miles.	Clean and regap the spark plug if wear is not excessive: Replace the spark plug if excessively worn:	4.7
	Carbon fouling (black, dry, fluffy deposits).	If present on one or two plugs:		
		Faulty high tension lead(s).	Test the high tension leads:	4.5
		Burnt or sticking valve(s).	Check the valve train: (Clean and regap the plugs in either case.)	9.1
		If present on most or all plugs: Overly rich fuel mixture, due to restricted air filter, improper carburetor adjustment, improper choke or heat riser adjustment or operation.	Check the fuel system:	5.1
	Oil fouling (wet black deposits)	Worn engine components. NOTE: *Oil fouling may occur in new or recently rebuilt engines until broken in.*	Check engine vacuum and compression: Replace with new spark plug	6.1
	Lead fouling (gray, black, tan, or yellow deposits, which appear glazed or cinder-like).	Combustion by-products.	Clean and regap the plugs: (Use plugs of a different heat range if the problem recurs.)	4.7

	Condition	Cause	Remedy	Proceed to
	Gap bridging (deposits lodged between the electrodes).	Incomplete combustion, or transfer of deposits from the combustion chamber.	Replace the spark plugs:	4.7
	Overheating (burnt electrodes, and extremely white insulator with small black spots).	Ignition timing advanced too far.	Adjust timing to specifications:	8.2
		Overly lean fuel mixture.	Check the fuel system:	5.1
		Spark plugs not seated properly.	Clean spark plug seat and install a new gasket washer: (Replace the spark plugs in all cases.)	4.7
	Fused spot deposits on the insulator.	Combustion chamber blow-by.	Clean and regap the spark plugs:	4.7
	Pre-ignition (melted or severely burned electrodes, blistered or cracked insulators, or metallic deposits on the insulator).	Incorrect spark plug heat range.	Replace with plugs of the proper heat range:	4.7
		Ignition timing advanced too far.	Adjust timing to specifications:	8.2
		Spark plugs not being cooled efficiently.	Clean the spark plug seat, and check the cooling system:	11.1
		Fuel mixture too lean.	Check the fuel system:	5.1
		Poor compression.	Check compression:	6.1
		Fuel grade too low.	Use higher octane fuel:	4.7

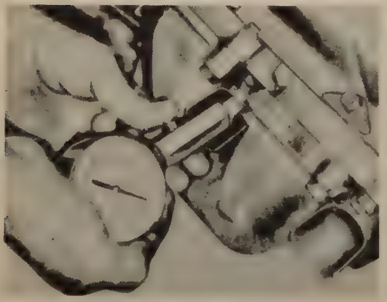
Test and Procedure	Results and Indications	Proceed to
4.7—Determine the static ignition timing: Using the flywheel or crankshaft pulley timing marks as a guide, locate top dead center on the *compression* stroke of the No. 1 cylinder. Remove the distributor cap.	Adjust the distributor so that the rotor points toward the No. 1 tower in the distributor cap, and the points are just opening:	4.8
4.8—Check coil polarity: Connect a voltmeter negative lead to the coil high tension lead, and the positive lead to ground (NOTE: *reverse the hook-up for positive ground cars*). Crank the engine momentarily.  Checking coil polarity	If the voltmeter reads up-scale, the polarity is correct:	5.1
	If the voltmeter reads down-scale, reverse the coil polarity (switch the primary leads):	5.1

Test and Procedure	*Results and Indications*	*Proceed to*
5.1—Determine that the air filter is functioning efficiently: Hold paper elements up to a strong light, and attempt to see light through the filter.	Clean permanent air filters in gasoline (or manufacturer's recommendation), and allow to dry. Replace paper elements through which light cannot be seen:	5.2
5.2—Determine whether a flooding condition exists: Flooding is identified by a strong gasoline odor, and excessive gasoline present in the throttle bore(s) of the carburetor.	If flooding is not evident:	5.3
	If flooding is evident, permit the gasoline to dry for a few moments and restart.	
	If flooding doesn't recur:	5.6
	If flooding is persistant:	5.5
5.3—Check that fuel is reaching the carburetor: Detach the fuel line at the carburetor inlet. Hold the end of the line in a cup (not styrofoam), and crank the engine.	If fuel flows smoothly:	5.6
	If fuel doesn't flow (NOTE: *Make sure that there is fuel in the tank*), or flows erratically:	5.4
5.4—Test the fuel pump: Disconnect all fuel lines from the fuel pump. Hold a finger over the input fitting, crank the engine (with electric pump, turn the ignition or pump on); and feel for suction.	If suction is evident, blow out the fuel line to the tank with low pressure compressed air until bubbling is heard from the fuel filler neck. Also blow out the carburetor fuel line (both ends disconnected):	5.6
	If no suction is evident, replace or repair the fuel pump:	5.6
	NOTE: *Repeated oil fouling of the spark plugs, or a no-start condition, could be the result of a ruptured vacuum booster pump diaphragm, through which oil or gasoline is being drawn into the intake manifold (where applicable).*	
5.5—Check the needle and seat: Tap the carburetor in the area of the needle and seat.	If flooding stops, a gasoline additive (e.g., Gumout) will often cure the problem:	5.6
	If flooding continues, check the fuel pump for excessive pressure at the carburetor (according to specifications). If the pressure is normal, the needle and seat must be removed and checked, and/or the float level adjusted:	5.6
5.6—Test the accelerator pump by looking into the throttle bores while operating the throttle.	If the accelerator pump appears to be operating normally:	5.7
	If the accelerator pump is not operating, the pump must be reconditioned. Where possible, service the pump with the carburetor(s) installed on the engine. If necessary, remove the carburetor. Prior to removal:	5.7
5.7—Determine whether the carburetor main fuel system is functioning: Spray a commercial starting fluid into the carburetor while attempting to start the engine.	If the engine starts, runs for a few seconds, and dies:	5.8
	If the engine doesn't start:	6.1

Test and Procedures	*Results and Indications*	*Proceed to*
5.8—Uncommon fuel system malfunctions: See below:	If the problem is solved:	6.1
	If the problem remains, remove and recondition the carburetor.	

Condition	*Indication*	*Test*	*Usual Weather Conditions*	*Remedy*
Vapor lock	Car will not restart shortly after running.	Cool the components of the fuel system until the engine starts.	Hot to very hot	Ensure that the exhaust manifold heat control valve is operating. Check with the vehicle manufacturer for the recommended solution to vapor lock on the model in question.
Carburetor icing	Car will not idle, stalls at low speeds.	Visually inspect the throttle plate area of the throttle bores for frost.	High humidity, 32-40° F.	Ensure that the exhaust manifold heat control valve is operating, and that the intake manifold heat riser is not blocked.
Water in the fuel	Engine sputters and stalls; may not start.	Pump a small amount of fuel into a glass jar. Allow to stand, and inspect for droplets or a layer of water.	High humidity, extreme temperature changes.	For droplets, use one or two cans of commercial gas dryer (Dry Gas) For a layer of water, the tank must be drained, and the fuel lines blown out with compressed air.

Test and Procedure	*Results and Indications*	*Proceed to*
6.1—Test engine compression: Remove all spark plugs. Insert a compression gauge into a spark plug port, crank the engine to obtain the maximum reading, and record.	If compression is within limits on all cylinders:	7.1
	If gauge reading is extremely low on all cylinders:	6.2
	If gauge reading is low on one or two cylinders: (If gauge readings are identical and low on two or more adjacent cylinders, the head gasket must be replaced.)	6.2

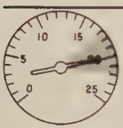
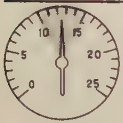
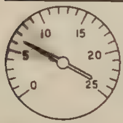
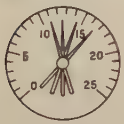
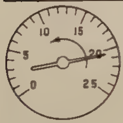
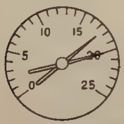
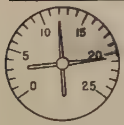
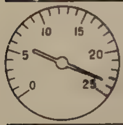


Testing compression
(© Chevrolet Div. G.M. Corp.)

Maxi. Press. Lbs. Sq. In.	*Min. Press. Lbs. Sq. In.*	*Maxi. Press. Lbs. Sq. In.*	*Min. Press. Lbs. Sq. In.*	*Max. Press. Lbs. Sq. In.*	*Min. Press. Lbs. Sq. In.*	*Max. Press. Lbs. Sq. In.*	*Min. Press. Lbs. Sq. In.*
134	101	162	121	188	141	214	160
136	102	164	123	190	142	216	162
138	104	166	124	192	144	218	163
140	105	168	126	194	145	220	165
142	107	170	127	196	147	222	166
146	110	172	129	198	148	224	168
148	111	174	131	200	150	226	169
150	113	176	132	202	151	228	171
152	114	178	133	204	153	230	172
154	115	180	135	206	154	232	174
156	117	182	136	208	156	234	175
158	118	184	138	210	157	236	177
160	120	186	140	212	158	238	178

Compression pressure limits
(© Buick Div. G.M. Corp.)

Test and Procedure	*Results and Indications*	*Proceed to*
6.2—Test engine compression (wet): Squirt approximately 30 cc. of engine oil into each cylinder, and retest per 6.1.	If the readings improve, worn or cracked rings or broken pistons are indicated:	Next Chapter
	If the readings do not improve, burned or excessively carboned valves or a jumped timing chain are indicated: NOTE: *A jumped timing chain is often indicated by difficult cranking.*	7.1
7.1—Perform a vacuum check of the engine: Attach a vacuum gauge to the intake manifold beyond the throttle plate. Start the engine, and observe the action of the needle over the range of engine speeds.	See below.	See below

	Reading	*Indications*	*Proceed to*
	Steady, from 17-22 in. Hg.	Normal.	8.1
	Low and steady.	Late ignition or valve timing, or low compression:	6.1
	Very low	Vacuum leak:	7.2
	Needle fluctuates as engine speed increases.	Ignition miss, blown cylinder head gasket, leaking valve or weak valve spring:	6.1, 8.3
	Gradual drop in reading at idle.	Excessive back pressure in the exhaust system:	10.1
	Intermittent fluctuation at idle.	Ignition miss, sticking valve:	8.3, 9.1
	Drifting needle.	Improper idle mixture adjustment, carburetors not synchronized (where applicable), or minor intake leak. Synchronize the carburetors, adjust the idle, and retest. If the condition persists:	7.2
	High and steady.	Early ignition timing:	8.2

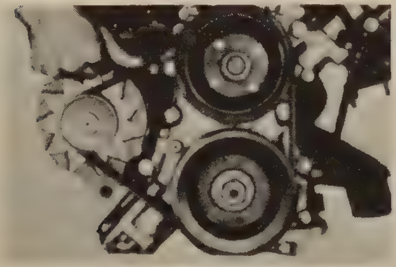
Test and Procedure	*Results and Indications*	*Proceed to*
7.2—Attach a vacuum gauge per 7.1, and test for an intake manifold leak. Squirt a small amount of oil around the intake manifold gaskets, carburetor gaskets, plugs and fittings. Observe the action of the vacuum gauge.	If the reading improves, replace the indicated gasket, or seal the indicated fitting or plug: If the reading remains low:	8.1 7.3
7.3—Test all vacuum hoses and accessories for leaks as described in 7.2. Also check the carburetor body (dashpots, automatic choke mechanism, throttle shafts) for leaks in the same manner.	If the reading improves, service or replace the offending part(s): If the reading remains low:	8.1 6.1
8.1—Check the point dwell angle: Connect a dwell meter between the distributor primary wire and ground. Start the engine, and observe the dwell angle from idle to 3000 rpm.	If necessary, adjust the dwell angle. NOTE: *Increasing the point gap reduces the dwell angle and vice-versa.* If the dwell angle moves outside specifications as engine speed increases, the distributor should be removed and checked for cam accuracy, shaft endplay and concentricity, bushing wear, and adequate point arm tension (NOTE: *Most of these items may be checked with the distributor installed in the engine, using an oscilloscope*):	8.2
8.2—Connect a timing light (per manufacturer's recommendation) and check the dynamic ignition timing. Disconnect and plug the vacuum hose(s) to the distributor if specified, start the engine, and observe the timing marks at the specified engine speed.	If the timing is not correct, adjust to specifications by rotating the distributor in the engine: (Advance timing by rotating distributor opposite normal direction of rotor rotation, retard timing by rotating distributor in same direction as rotor rotation.)	8.3
8.3—Check the operation of the distributor advance mechanism(s): To test the mechanical advance, disconnect all but the mechanical advance, and observe the timing marks with a timing light as the engine speed is increased from idle. If the mark moves smoothly, without hesitation, it may be assumed that the mechanical advance is functioning properly. To test vacuum advance and/or retard systems, alternately crimp and release the vacuum line, and observe the timing mark for movement. If movement is noted, the system is operating.	If the systems are functioning: If the systems are not functioning, remove the distributor, and test on a distributor tester:	8.4 8.4
8.4—Locate an ignition miss: With the engine running, remove each spark plug wire, one by one, until one is found that doesn't cause the engine to roughen and slow down.	When the missing cylinder is identified:	4.1

Test and Procedure	*Results and Indications*	*Proceed to*
9.1—Evaluate the valve train: Remove the valve cover, and ensure that the valves are adjusted to specifications. A mechanic's stethoscope may be used to aid in the diagnosis of the valve train. By pushing the probe on or near push rods or rockers, valve noise often can be isolated. A timing light also may be used to diagnose valve problems. Connect the light according to manufacturer's recommendations, and start the engine. Vary the firing moment of the light by increasing the engine speed (and therefore the ignition advance), and moving the trigger from cylinder to cylinder. Observe the movement of each valve.	See below	See below

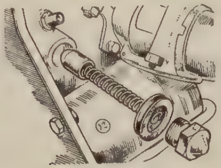
Observation	*Probable Cause*	*Remedy*	*Proceed to*
Metallic tap heard through the stethoscope.	Sticking hydraulic lifter or excessive valve clearance.	Adjust valve. If tap persists, remove and replace the lifter:	10.1
Metallic tap through the stethoscope, able to push the rocker arm (lifter side) down by hand.	Collapsed valve lifter.	Remove and replace the lifter:	10.1
Erratic, irregular motion of the valve stem.*	Sticking valve, burned valve.	Recondition the valve and/or valve guide:	Next Chapter
Eccentric motion of the pushrod at the rocker arm.*	Bent pushrod.	Replace the pushrod:	10.1
Valve retainer bounces as the valve closes.*	Weak valve spring or damper.	Remove and test the spring and damper. Replace if necessary:	10.1

*—When observed with a timing light.

Test and Procedure	*Results and Indications*	*Proceed to*
9.2—Check the valve timing: Locate top dead center of the No. 1 piston, and install a degree wheel or tape on the crankshaft pulley or damper with zero corresponding to an index mark on the engine. Rotate the crankshaft in its direction of rotation, and observe the opening of the No. 1 cylinder intake valve. The opening should correspond with the correct mark on the degree wheel according to specifications.	If the timing is not correct, the timing cover must be removed for further investigation:	

Test and Procedure	*Results and Indications*	*Proceed to*
10.1—Determine whether the exhaust manifold heat control valve is operating: Operate the valve by hand to determine whether it is free to move. If the valve is free, run the engine to operating temperature and observe the action of the valve, to ensure that it is opening.	If the valve sticks, spray it with a suitable solvent, open and close the valve to free it, and retest.	
	If the valve functions properly:	10.2
	If the valve does not free, or does not operate, replace the valve:	10.2
10.2—Ensure that there are no exhaust restrictions: Visually inspect the exhaust system for kinks, dents, or crushing. Also note that gasses are flowing freely from the tailpipe at all engine speeds, indicating no restriction in the muffler or resonator.	Replace any damaged portion of the system:	11.1
11.1—Visually inspect the fan belt for glazing, cracks, and fraying, and replace if necessary. Tighten the belt so that the longest span has approximately ½″ play at its midpoint under thumb pressure. 	Replace or tighten the fan belt as necessary: **Checking the fan belt tension** (© Nissan Motor Co. Ltd.)	11.2
11.2—Check the fluid level of the cooling system.	If full or slightly low, fill as necessary:	11.5
	If extremely low:	11.3
11.3—Visually inspect the external portions of the cooling system (radiator, radiator hoses, thermostat elbow, water pump seals, heater hoses, etc.) for leaks. If none are found, pressurize the cooling system to 14-15 psi.	If cooling system holds the pressure:	11.5
	If cooling system loses pressure rapidly, reinspect external parts of the system for leaks under pressure. If none are found, check dipstick for coolant in crankcase. If no coolant is present, but pressure loss continues:	11.4
	If coolant is evident in crankcase, remove cylinder head(s), and check gasket(s). If gaskets are intact, block and cylinder head(s) should be checked for cracks or holes.	
	If the gasket(s) is blown, replace, and purge the crankcase of coolant:	12.6
	NOTE: *Occasionally, due to atmospheric and driving conditions, condensation of water can occur in the crankcase. This causes the oil to appear milky white. To remedy, run the engine until hot, and change the oil and oil filter.*	

Test and Procedure	*Results and Indication*	*Proceed to*
11.4—Check for combustion leaks into the cooling system: Pressurize the cooling system as above. Start the engine, and observe the pressure gauge. If the needle fluctuates, remove each spark plug wire, one by one, noting which cylinder(s) reduce or eliminate the fluctuation. Radiator pressure tester (© American Motors Corp.)	Cylinders which reduce or eliminate the fluctuation, when the spark plug wire is removed, are leaking into the cooling system. Replace the head gasket on the affected cylinder bank(s).	
11.5—Check the radiator pressure cap: Attach a radiator pressure tester to the radiator cap (wet the seal prior to installation). Quickly pump up the pressure, noting the point at which the cap releases. Testing the radiator pressure cap (© American Motors Corp.)	If the cap releases within ± 1 psi of the specified rating, it is operating properly:	11.6
	If the cap releases at more than ± 1 psi of the specified rating, it should be replaced:	11.6
11.6—Test the thermostat: Start the engine cold, remove the radiator cap, and insert a thermometer into the radiator. Allow the engine to idle. After a short while, there will be a sudden, rapid increase in coolant temperature. The temperature at which this sharp rise stops is the thermostat opening temperature.	If the thermostat opens at or about the specified temperature:	11.7
	If the temperature doesn't increase: (If the temperature increases slowly and gradually, replace the thermostat.)	11.7
11.7—Check the water pump: Remove the thermostat elbow and the thermostat, disconnect the coil high tension lead (to prevent starting), and crank the engine momentarily.	If coolant flows, replace the thermostat and retest per 11.6:	11.6
	If coolant doesn't flow, reverse flush the cooling system to alleviate any blockage that might exist. If system is not blocked, and coolant will not flow, recondition the water pump.	—
12.1—Check the oil pressure gauge or warning light: If the gauge shows low pressure, or the light is on, for no obvious reason, remove the oil pressure sender. Install an accurate oil pressure gauge and run the engine momentarily.	If oil pressure builds normally, run engine for a few moments to determine that it is functioning normally, and replace the sender.	—
	If the pressure remains low:	12.2
	If the pressure surges:	12.3
	If the oil pressure is zero:	12.3

Test and Procedure	*Results and Indications*	*Proceed to*
12.2—Visually inspect the oil: If the oil is watery or very thin, milky, or foamy, replace the oil and oil filter.	If the oil is normal:	12.3
	If after replacing oil the pressure remains low:	12.3
	If after replacing oil the pressure becomes normal:	—
12.3—Inspect the oil pressure relief valve and spring, to ensure that it is not sticking or stuck. Remove and thoroughly clean the valve, spring, and the valve body.  Oil pressure relief valve (© British Leyland Motors)	If the oil pressure improves:	—
	If no improvement is noted:	12.4
12.4—Check to ensure that the oil pump is not cavitating (sucking air instead of oil): See that the crankcase is neither over nor underfull, and that the pickup in the sump is in the proper position and free from sludge.	Fill or drain the crankcase to the proper capacity, and clean the pickup screen in solvent if necessary. If no improvement is noted:	12.5
12.5—Inspect the oil pump drive and the oil pump:	If the pump drive or the oil pump appear to be defective, service as necessary and retest per 12.1:	12.1
	If the pump drive and pump appear to be operating normally, the engine should be disassembled to determine where blockage exists:	Next Chapter
12.6—Purge the engine of ethylene glycol coolant: Completely drain the crankcase and the oil filter. Obtain a commercial butyl cellosolve base solvent, designated for this purpose, and follow the instructions precisely. Following this, install a new oil filter and refill the crankcase with the proper weight oil. The next oil and filter change should follow shortly thereafter (1000 miles).		

3 · Engine and Engine Rebuilding

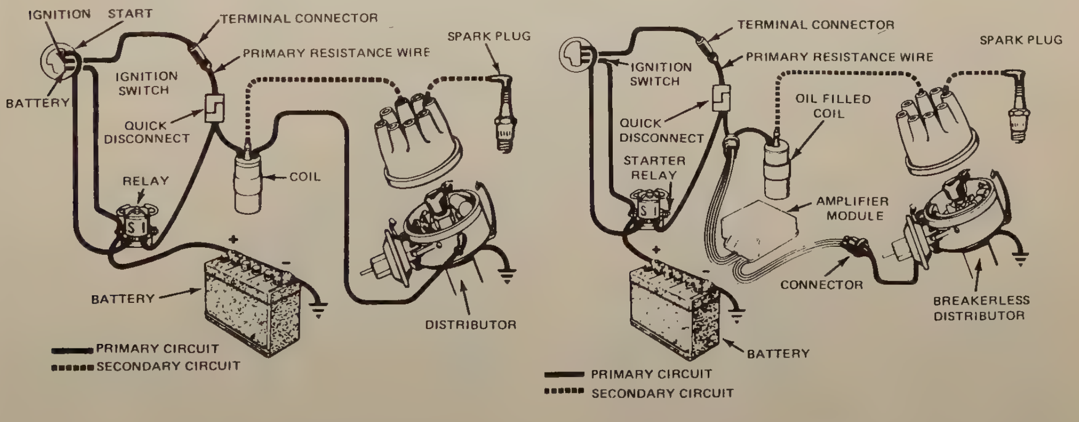
Engine Electrical

IGNITION SYSTEM

Two types of ignition systems are utilized in Mavericks and Comets. A conventional ignition system using breaker points and condenser is used on all 1970–73 models and most 1974 models sold outside the state of California. A breakerless (solid-state) ignition system using an armature and magnetic pickup coil assembly in the distributor and a solid-state amplifier module inline between the coil and the distributor is installed in all 1974 Mavericks and Comets sold in the state of California, and installed in all 1975–76 models sold nationwide.

Both systems employ a distributor which is driven by the camshaft at one-half crankshaft rpm, high-voltage rotor, distributor cap and spark plug wiring, and an oil-filled conventional type coil.

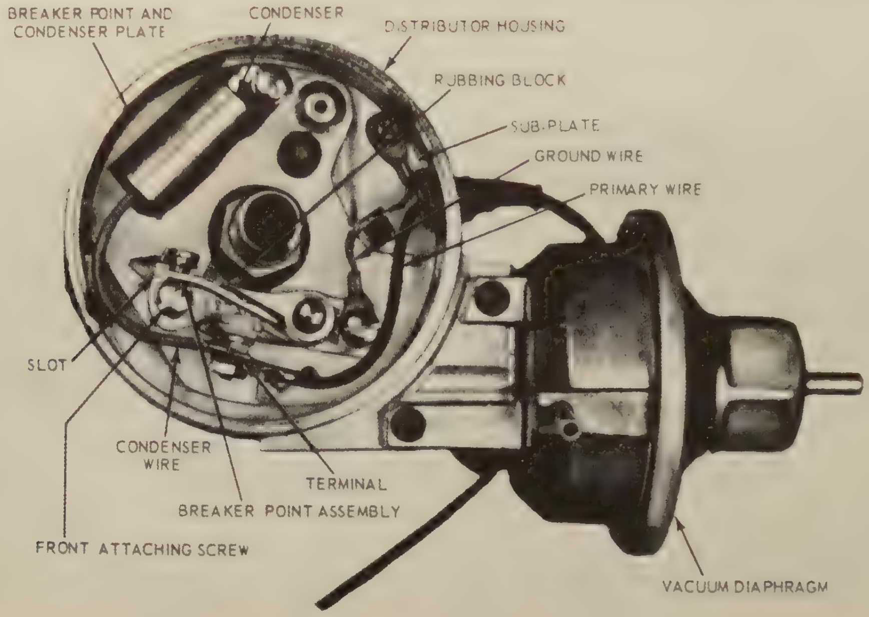
The two systems differ in the manner in which they convert electrical primary voltage (12 volts) from the battery into secondary voltage (at least 20,000 volts) to


IGNITION
START
BATTERY
TERMINAL CONNECTOR
PRIMARY RESISTANCE WIRE
SPARK PLUG
IGNITION SWITCH
QUICK DISCONNECT
RELAY
COIL
BATTERY
DISTRIBUTOR
PRIMARY CIRCUIT
SECONDARY CIRCUIT
TERMINAL CONNECTOR
PRIMARY RESISTANCE WIRE
SPARK PLUG
IGNITION SWITCH
OIL FILLED COIL
QUICK DISCONNECT
STARTER RELAY
AMPLIFIER MODULE
CONNECTOR
BREAKERLESS DISTRIBUTOR
BATTERY
PRIMARY CIRCUIT
SECONDARY CIRCUIT

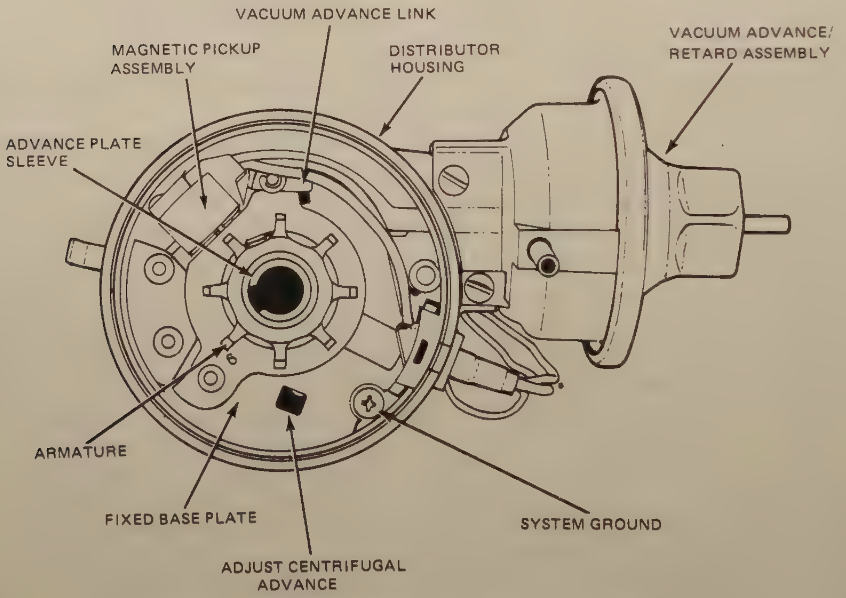
CONVENTIONAL

BREAKERLESS

Typical Ignition Systems

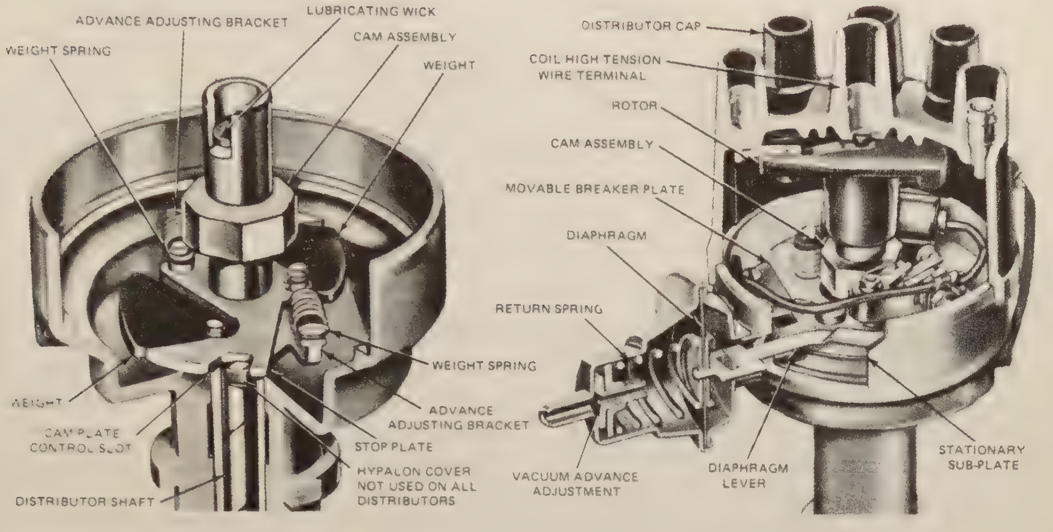

BREAKER POINT AND CONDENSER PLATE
CONDENSER
DISTRIBUTOR HOUSING
RUBBING BLOCK
SUB-PLATE
GROUND WIRE
PRIMARY WIRE
SLOT
CONDENSER WIRE
TERMINAL
BREAKER POINT ASSEMBLY
FRONT ATTACHING SCREW
VACUUM DIAPHRAGM

Distributor Cap and Rotor Removed—Conventional Distributor


VACUUM ADVANCE LINK
MAGNETIC PICKUP ASSEMBLY
DISTRIBUTOR HOUSING
VACUUM ADVANCE/ RETARD ASSEMBLY
ADVANCE PLATE SLEEVE
ARMATURE
FIXED BASE PLATE
SYSTEM GROUND
ADJUST CENTRIFUGAL ADVANCE

Distributor Cap and Rotor Removed—Breakerless Distributor

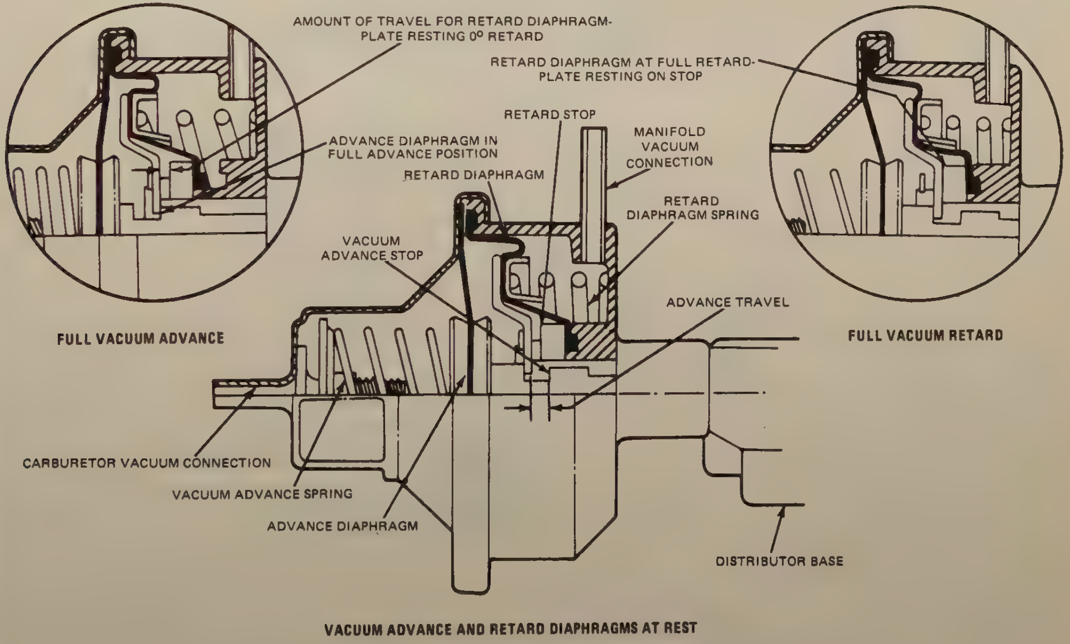
fire the spark plugs. In the conventional system, the breaker points open and close as the moveable breaker arm rides the rotating distributor cam eccentric, thereby opening and closing the current to the coil. When the points open, they interrupt the flow of primary current to the coil, causing a collapse of the magnetic field in the coil and creating a high tension spark which is used to fire the spark plugs. In the breakerless system, a distributor shaft-mounted armature rotates past a magnetic pickup coil assembly causing fluctuations in the magnetic field generated by the pickup coil. These fluctuations in turn, cause the amplifier module to turn the ignition coil current off and on, creating the high tension spark to fire the spark plugs.


ADVANCE ADJUSTING BRACKET
LUBRICATING WICK
CAM ASSEMBLY
WEIGHT SPRING
WEIGHT
WEIGHT SPRING
ADVANCE ADJUSTING BRACKET
WEIGHT
CAM PLATE CONTROL SLOT
STOP PLATE
HYPALON COVER NOT USED ON ALL DISTRIBUTORS
DISTRIBUTOR SHAFT
DISTRIBUTOR CAP
COIL HIGH TENSION WIRE TERMINAL
ROTOR
CAM ASSEMBLY
MOVABLE BREAKER PLATE
DIAPHRAGM
RETURN SPRING
VACUUM ADVANCE ADJUSTMENT
DIAPHRAGM LEVER
STATIONARY SUB-PLATE

Advance Mechanisms—Dual Advance Distributor with Single Diaphragm

The amplifier module electronically controls the dwell, which is controlled mechanically in a conventional system by the duration that the points remain closed.

Both the conventional and breakerless ignition systems are equipped with dual advance distributors. The vacuum advance unit governs ignition timing according to engine load, while the centrifugal advance unit governs ignition timing according to engine rpm. Centrifugal advance is controlled by spring-mounted weights contained in the distributor, located under the breaker point mounting plate on conventional systems and under the fixed base plate on breakerless systems. As engine speed increases, centrifugal force moves the weights outward from the distributor shaft advancing the position of the distributor cam (conventional) or armature (breakerless), thereby advancing the ignition timing. Vacuum advance is controlled by a vacuum diaphragm which is mounted on the side of the distributor and attached to the breaker point mounting plate (conventional) or the magnetic pickup coil as-


AMOUNT OF TRAVEL FOR RETARD DIAPHRAGM-PLATE RESTING 0° RETARD
RETARD DIAPHRAGM AT FULL RETARD-PLATE RESTING ON STOP
RETARD STOP
MANIFOLD VACUUM CONNECTION
ADVANCE DIAPHRAGM IN FULL ADVANCE POSITION
RETARD DIAPHRAGM
RETARD DIAPHRAGM SPRING
VACUUM ADVANCE STOP
ADVANCE TRAVEL
FULL VACUUM ADVANCE
FULL VACUUM RETARD
CARBURETOR VACUUM CONNECTION
VACUUM ADVANCE SPRING
ADVANCE DIAPHRAGM
DISTRIBUTOR BASE
VACUUM ADVANCE AND RETARD DIAPHRAGMS AT REST

Dual Diaphragm Vacuum Advance and Retard Mechanisms sembly (breakerless) via the vacuum advance link. Under light acceleration, the engine is operating under a low-load condition, causing the carburetor vacuum to act on the distributor vacuum diaphragm, moving the breaker point mounting plate (conventional) or pickup coil assembly (breakerless) opposite the direction of distributor shaft rotation, thereby advancing the ignition timing.

The distributors on many models also incorporate a vacuum retard mechanism. The retard mechanism is contained in the rear of the vacuum diaphragm chamber. When the engine is operating under high-vacuum conditions (deceleration or idle), intake manifold vacuum is applied to the retard mechanism. The retard mechanism moves the the breaker points mounting plate (conventional) or pickup coil assembly (breakerless) in the direction of distributor rotation, thereby retarding the ignition timing. Ignition retard, under these conditions, reduces exhaust emissions of hydrocarbons, although it does reduce engine efficiency somewhat.

DISTRIBUTOR

Removal and Installation

1. On 302 V8 models, remove the air cleaner.

2. On models equipped with a conventional ignition system, disconnect the primary wire at the coil. On models equipped with breakerless ignition, disconnect the distributor wiring connector from the vehicle wiring harness.

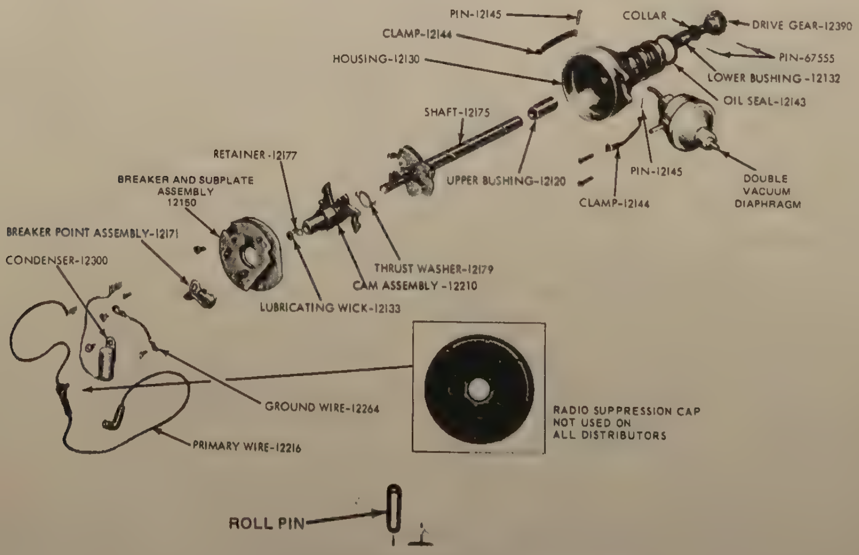
3. Noting the position of the vacuum line(s) on the distributor diaphragm, disconnect the lines at the diaphragm. Unsnap the two distributor cap retaining clamps and remove the cap. Position the cap and ignition wires to one side.

4. Using chalk or paint, carefully mark the position of the distributor rotor in relation to the distributor housing and mark the position of the distributor housing in relation to the engine block. When this is done, you should have a line on the distributor housing directly in line with the tip of the rotor and another line on the engine block directly in line with the mark on the distributor housing. This is very important because the distributor must be reinstalled in the exact same location from which it was removed, if correct ignition timing is to be maintained.

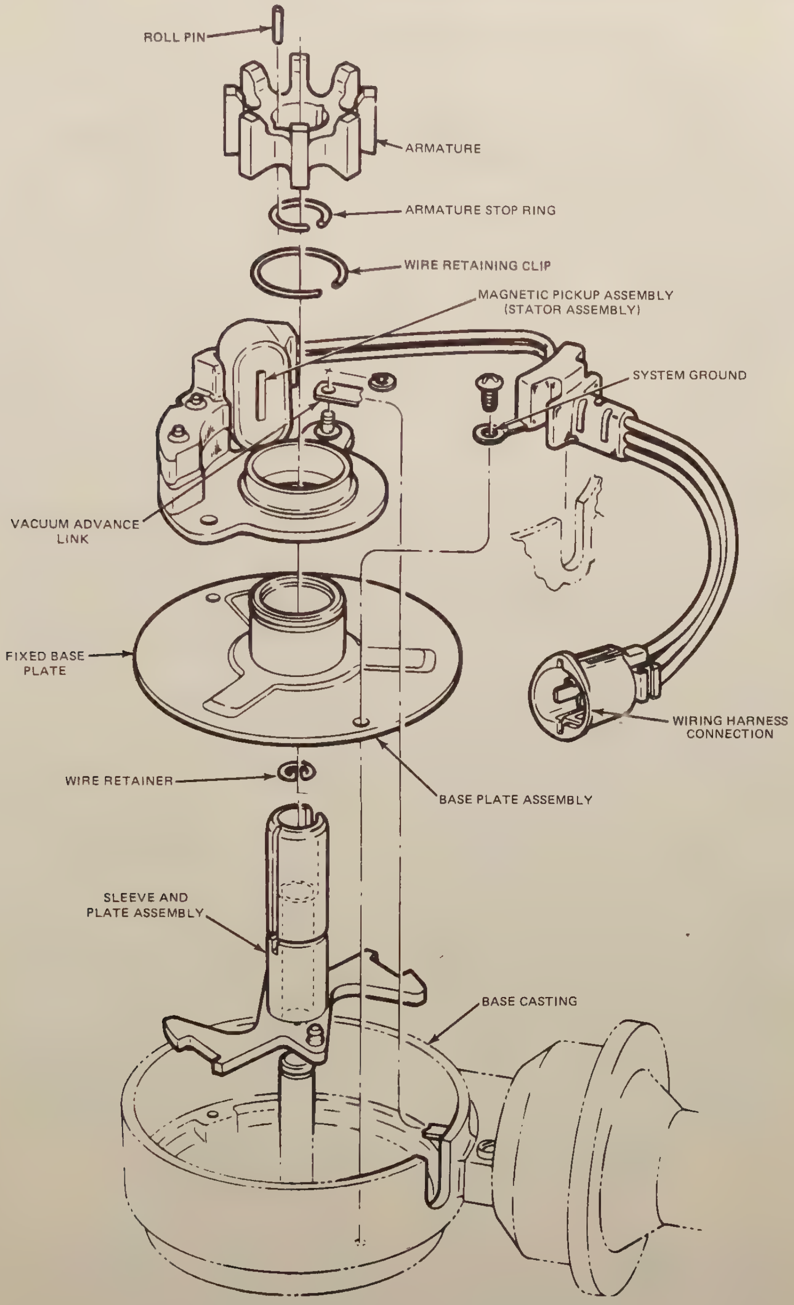
5. Remove the distributor hold-down bolt and clamp. Remove the distributor from the engine.

NOTE: *Do not disturb the engine while the distributor is removed. If you attempt to start the engine with the distributor removed, you will have to retime the engine.*

6a. If the engine was cranked (disturbed) with the distributor removed, it will now be necessary to retime the engine. If the distributor has been installed

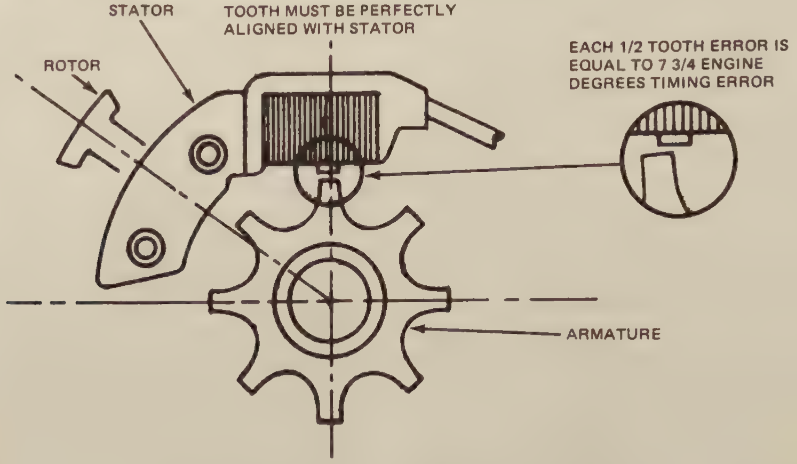

PIN-12145
COLLAR
DRIVE GEAR-12390
CLAMP-12144
HOUSING-12130
PIN-67555
LOWER BUSHING-12132
OIL SEAL-12143
SHAFT-12175
RETAINER-12177
BREAKER AND SUBPLATE ASSEMBLY 12150
UPPER BUSHING-12120
PIN-12145
DOUBLE VACUUM DIAPHRAGM
CLAMP-12144
BREAKER POINT ASSEMBLY-12171
CONDENSER-12300
THRUST WASHER-12179
CAM ASSEMBLY-12210
LUBRICATING WICK-12133
GROUND WIRE-12264
PRIMARY WIRE-12216
RADIO SUPPRESSION CAP NOT USED ON ALL DISTRIBUTORS
ROLL PIN

Conventional V8 Distributor Disassembled


ROLL PIN
ARMATURE
ARMATURE STOP RING
WIRE RETAINING CLIP
MAGNETIC PICKUP ASSEMBLY (STATOR ASSEMBLY)
SYSTEM GROUND
VACUUM ADVANCE LINK
FIXED BASE PLATE
WIRING HARNESS CONNECTION
WIRE RETAINER
BASE PLATE ASSEMBLY
SLEEVE AND PLATE ASSEMBLY
BASE CASTING

Breakerless V8 Distributor Disassembled

incorrectly and the engine will not start, remove the distributor from the engine and start over again. Hold the distributor close to the engine and install the cap on the distributor in its normal position. Locate the no. 1 spark plug tower on the distributor cap. Scribe a mark on the body of the distributor directly below the no. 1 spark plug wire tower on the distributor cap. Remove the distributor cap from the distributor and move the distributor and cap to one side. Remove the no. 1 spark plug and crank the engine over until the no. 1 cylinder is on its compression stroke. To accomplish this, place a wrench on the lower engine pulley and turn the engine slowly in a clockwise (6 cylinder) or counterclockwise (V8) direction until the 6° BTDC mark on the crankshaft damper aligns with the timing pointer. If you place


STATOR
TOOTH MUST BE PERFECTLY ALIGNED WITH STATOR
ROTOR
EACH 1/2 TOOTH ERROR IS EQUAL TO 7 3/4 ENGINE DEGREES TIMING ERROR
ARMATURE

Breakerless Distributor Static Timing Position

your finger in the no. 1 spark plug hole, you will feel air escaping as the piston rises in the combustion chamber. On conventional ignition systems, the rotor must be at no. 1 firing position to install the distributor. On breakerless ignition systems, one of the armature segments must be aligned with the stator as shown in the accompanying illustration to install the distributor. Make sure that the oil pump intermediate shaft properly engages the distributor shaft. It may be necessary to crank the engine with the starter, after the distributor drive gear is partially engaged, in order to engage the oil pump intermediate shaft. Install, but do not tighten the retaining clamp and bolt. Rotate the distributor to advance the timing to a point where the armature tooth is aligned properly (breakerless ignition) or to a point where the points are just starting to open (conventional ignition). Tighten the clamp.

6b. If the engine was not cranked (disturbed) when the distributor was removed, position the distributor in the block with the rotor aligned with the mark previously scribed on the distributor body and the marks on the distributor body and cylinder block in alignment. Install the distributor hold-down bolt and clamp finger-tight.

7. Install the distributor cap and wires.

8. On models equipped with conventional ignition, connect the primary wire at the coil. On models equipped with breakerless ignition, connect the distributor wiring connector to the wiring harness.

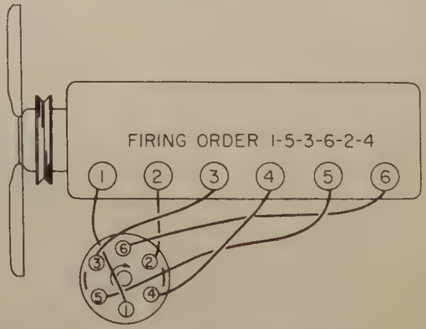
9. Check the ignition timing as outlined in Chapter Two.

10. Install the air cleaner, if removed.

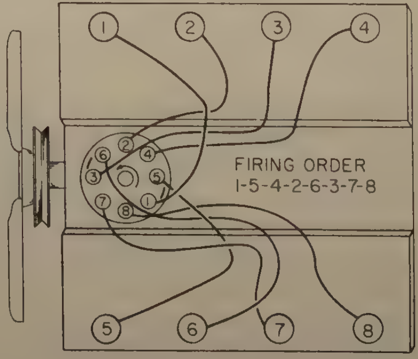
CHARGING SYSTEM

The charging system is composed of the alternator, alternator regulator, charging

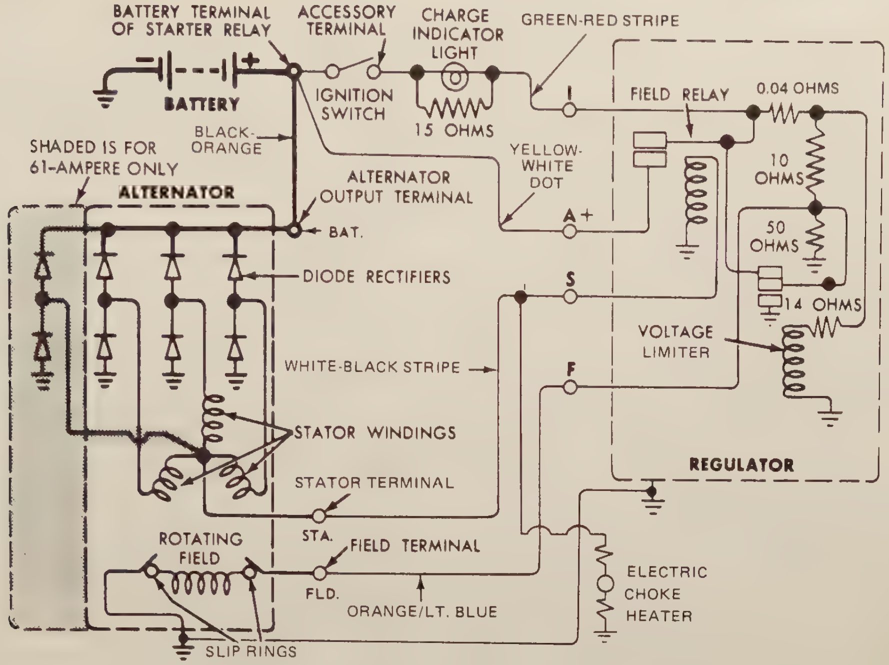
Firing Order


FIRING ORDER 1-5-3-6-2-4
1
2
3
4
5
6
6
3
2
5
4
1

Firing Order—Six-Cylinder Engines


1
2
3
4
FIRING ORDER 1-5-4-2-6-3-7-8
2
4
6
3
5
7
8
1
5
6
7
8

Firing Order—V8 Engine


BATTERY TERMINAL OF STARTER RELAY
ACCESSORY TERMINAL
CHARGE INDICATOR LIGHT
GREEN-RED STRIPE
BATTERY
IGNITION SWITCH
15 OHMS
I
FIELD RELAY
0.04 OHMS
BLACK-ORANGE
SHADED IS FOR 61-AMPERE ONLY
ALTERNATOR
YELLOW-WHITE DOT
10 OHMS
ALTERNATOR OUTPUT TERMINAL
A+
BAT.
50 OHMS
DIODE RECTIFIERS
S
14 OHMS
VOLTAGE LIMITER
WHITE-BLACK STRIPE
F
STATOR WINDINGS
REGULATOR
STATOR TERMINAL
STA.
ROTATING FIELD
FIELD TERMINAL
FLD.
ELECTRIC CHOKE HEATER
ORANGE/LT. BLUE
SLIP RINGS

Alternator Charging Circuit w/Indicator Light

system warning light, battery, and fuse link wire.

A failure of any component of the charging system can cause the entire system to stop functioning. Because of this, the charging system can be very difficult to troubleshoot when problems occur.

When the ignition key is turned on, current flows from the battery, through the charging system indicator light on the instrument panel, to the voltage regulator, and to the alternator. Since the alternator is not producing any current, the alternator warning light comes on. When the engine is started, the alternator begins to produce current and turns the alternator light off. As the alternator turns and produces current, that current is divided in two ways: part to the battery to charge the battery and power the electrical components of the vehicle, and part is returned to the alternator to enable it to increase its output. In this situation, the alternator is receiving current from the battery and from itself. A voltage regulator is wired into the current supply to the alternator to prevent it from receiving too much current which would cause it to put out too much current. Conversely, if the voltage regulator does not allow the alternator to receive enough current, the battery will not be fully charged and will eventually go dead.

The battery is connected to the alternator at all times, whether the ignition key is turned on or not. If the battery were shorted to ground, the alternator would also be shorted. This would damage the alternator. To prevent this, a fuse link is installed in the wiring between the battery and the alternator on all 1970 and later models. If the battery is shorted, the fuse link is melted, protecting the alternator.

Since the alternator, the alternator regulator, the charging system warning light, the battery and the fuse link are all interconnected, the failure of one component can cause the others to become inoperative.

Alternator Precautions

Several precautions must be observed with alternator equipped vehicles to avoid damaging the unit. They are as follows:

1. If the battery is removed for any reason, make sure that it is reconnected with the correct polarity. Reversing the battery connections may result in damage to the one-way rectifiers.
2. When utilizing a booster battery as a starting aid, always connect it as follows: positive to positive, and negative (booster battery) to a good ground on the engine of the car being started.
3. Never use a fast charger as a booster

to start cars with alternating-current (AC) circuits.

4. When servicing the battery with a fast charger, always disconnect the car battery cables.

5. Never attempt to polarize an alternator.

6. Avoid long soldering times when replacing diodes or transistors. Prolonged heat is damaging to alternators.

7. Do not use test lamps of more than 12 volts (V) for checking diode continuity.

8. Do not short across or ground any of the terminals on the alternator.

9. The polarity of the battery, alternator, and regulator must be matched and considered before making any electrical connections within the system.

10. Never separate the alternator on an open circuit. Make sure that all connections within the circuit are clean and tight.

11. Disconnect the battery terminals when performing any service on the electrical system. This will eliminate the possibility of accidental reversal of polarity.

12. Disconnect the battery ground cable if arc welding is to be done on any part of the car.

Troubleshooting

There are many different types of charging system problems and most require expensive tools to diagnose. When one component of the system fails completely and the charging system warning light comes on, it is a little easier to locate the source of the problem. We will only deal with a complete failure of the system which causes the battery to go dead.

You will need two testing instruments for use in this section. They are both relatively cheap and readily available. The first is a current indicator. This device, when placed on a wire which has current passing through it, measures the current in amps. The other is a test light. This is simply a pointed screwdriver which contains a light bulb and has a ground wire attached to it. When the pointed end is touched to an electrical component that should have current running to it, and the ground wire is attached to a good ground, the light in the handle will come on to verify that current is indeed coming to the component.

This test works under three assumptions:

A. The battery is known to be good and fully charged;

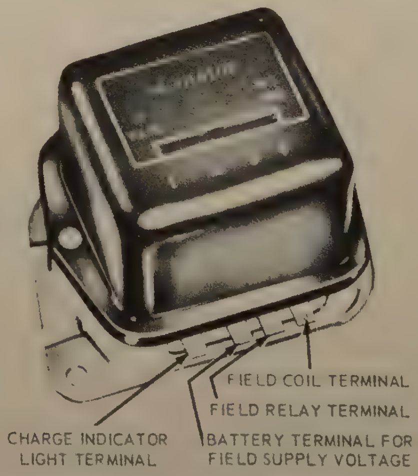
B. The alternator belt is in good condition and adjusted to the proper tension;

C. All connections in the system are clean and tight.

NOTE: *In order for the current indicator to give a valid reading, the car must be equipped with battery cables which are of the same gauge size and quality as original equipment battery cables.*

1. Turn off all electrical components on the car. Make sure the doors of the car are closed. If the car is equipped with a clock, disconnect the clock by removing the lead wire from the rear of the clock. Disconnect the positive battery cable from the battery and connect the ground wire on a test light to the disconnected positive battery cable. Touch the probe end of the test light to the positive battery post. The test light should not light. If the test light does light, there is a short or open circuit on the car. See Chapter 5 for troubleshooting procedures for this problem.

2. Disconnect the voltage regulator wiring harness connector at the voltage regulator. Turn on the ignition key. Connect the wire on a test light to a good ground (engine bolt). Touch the probe end of a test light to the ignition wire connector in the voltage regulator wiring connector. This wire corresponds to the "I" terminal on the regulator. If the test light goes on, the charging system warning light circuit is complete. If the test light does not come


FIELD COIL TERMINAL
FIELD RELAY TERMINAL
CHARGE INDICATOR LIGHT TERMINAL
BATTERY TERMINAL FOR FIELD SUPPLY VOLTAGE

Voltage Regulator Terminal Locations

on and the warning light on the instrument panel is on, either the resistor wire, which is parallel with the warning light, or the wiring to the voltage regulator, is defective. If the test light does not come on and the warning light is not on, either the bulb is defective or the power supply wire from the battery through the ignition switch to the bulb has an open circuit. Connect the wiring harness to the regulator.

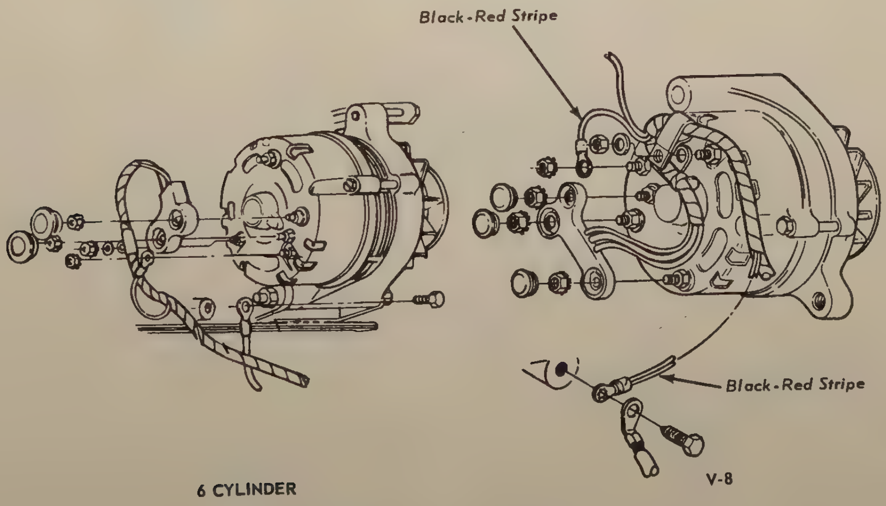
3. Examine the fuse link wire in the wiring harness from the starter relay to the alternator. If the insulation on the wire is cracked or split, the fuse link may be melted. Connect a test light to the fuse link by attaching the ground wire on the test light to an engine bolt and touching the probe end of the light to the bottom of the fuse link wire where it splices into the alternator output wire. If the bulb in the test light does not light, the fuse link is melted.

4. Start the engine and place a current indicator on the positive battery cable. Turn off all electrical accessories and make sure the doors are closed. If the charging system is working properly, the gauge will show a charge of about 5 amps. If the system is not working properly, the gauge will show a draw of about 5 amps. A charge moves the needle toward the battery, a draw moves the needle away from the battery. Turn the engine off.

5. Disconnect the wiring harness from the voltage regulator at the regulator connector. Connect a male spade terminal (solderless connector) to each end of a jumper wire. Insert one end of the wire into the wiring harness connector which corresponds to the "A" terminal on the regulator. Insert the other end of the wire into the wiring harness connector which corresponds to the "F" terminal on the regulator. Position the connector with the jumper wire installed so that it cannot contact any metal surface under the hood. Position a current indicator gauge on the positive battery cable. Have an assistant start the engine. Observe the reading on the current indicator. Have your assistant slowly raise the speed of the engine to about 2,000 rpm or until the current indicator needle stops moving, whichever comes first. Do not run the engine for more than a short period of time in this condition. If the wiring harness connector or jumper wire becomes excessively hot during this test, turn off the engine and check for a grounded wire in the regulator wiring harness. If the current indicator shows a charge of about three amps less than the output of the alternator, the alternator is working properly. If the previous test showed a draw, the voltage regulator is defective. If the gauge does not show the proper charging rate, the alternator is defective.

ALTERNATOR

While internal alternator repairs are possible, they require specialized tools and

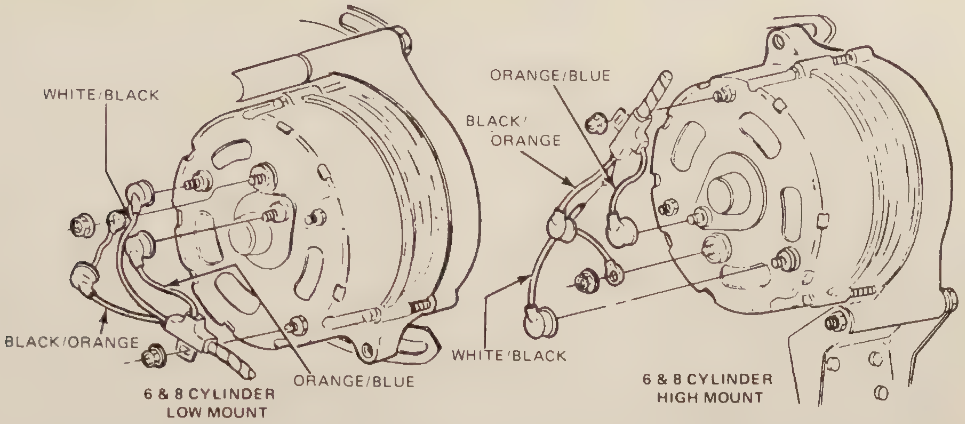


Alternator Wiring Harness Connections—1970–72

Alternator and Regulator Specifications

	Alternator					Regulator		
Year	Type		Tag Color	Field Current @ 12 V	Output (Amps)	Identifying Color	Voltage Setting (Volts @ 50–125°F)	Field Relay Closing Volts
1970	Autolite	D0ZF-B	Purple	2.4	38	Silver	13.3–15.3	2.0–4.2
	(Motorcraft)	D0AF-C	Orange	2.9	42	Silver	13.3–15.3	2.0–4.2
		D0AF-E	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
		D0AF-H	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
1971	Autolite	D0ZF-B	Purple	2.4	38	Silver	13.3–15.3	2.0–4.2
	(Motorcraft)	C9AF-A	Orange	2.9	42	Silver	13.3–15.3	2.0–4.2
		D0AF-H	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
		D0SF-A	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
1972	Autolite	D2ZF-AA	Purple	2.4	38	Silver	13.3–15.3	2.0–4.2
	(Motorcraft)	D2AF-AA	Orange	2.9	42	Silver	13.3–15.3	2.0–4.2
		D2AF-BA	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
		D2SF-AA	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
1973	Motorcraft	D3ZF-AA	Purple	2.4	38	Silver	13.3–15.3	2.0–4.2
		D3OF-FA	Orange	2.9	42	Silver	13.3–15.3	2.0–4.2
		D3OF-BA, CA	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
		D3DF-AA	Green	2.9	61	Yellow	13.3–15.3	2.0–4.2
1974	Motorcraft	D3ZF-AA (D42F-BA) *	Purple	2.4	38	Silver	13.3–15.3	2.0–4.2
		D3OF-FA (D40F-AA) *	Orange	2.9	42	Silver	13.3–15.3	2.0–4.2
		D3OF-BA, CA (D40F-BA, CA) *	Red	2.9	55	Yellow	13.3–15.3	2.0–4.2
		D3DF-AA	Green	2.9	61	Yellow	13.3–15.3	2.0–4.2
1975-76	Motorcraft	D5AF-AA	Orange	2.9	40	—	13.5–15.3	2.5–4.0
		D5AF-CA, KA, LA	Green	2.9	60	—	13.5–15.3	2.5–4.0

* Type designations in parentheses ( ) are for California models only.



Alternator Wiring Harness Connections—1973–76

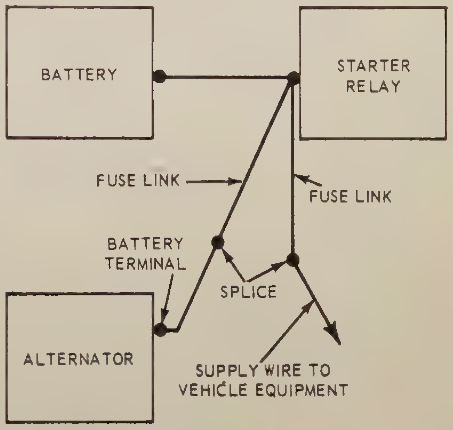
training. Therefore, it is advisable to replace a defective alternator, or have it repaired by a qualified shop.

Removal and Installation

1. Disconnect the negative battery cable from the battery.
2. Disconnect the wires from the rear of the alternator.
3. Loosen the alternator mounting bolts and remove the belt.
4. Remove the alternator mounting bolts and remove the alternator.
5. To install, position the alternator on the engine and install the attaching bolts.
6. Connect the wires on the rear of the alternator.
7. Position the belt on the alternator.
8. Adjust alternator belt tension as described below under "Belt Tension Adjustment."
9. Connect the negative battery cable.

FUSE LINK

The fuse link is a short length of insulated wire contained in the alternator wiring harness, between the alternator and the starter relay. The fuse link is several wire guage sizes smaller than the other wires in the harness. If a booster battery is connected incorrectly to the car battery or if some component of the charging system is shorted to ground, the fuse link melts and protects the alternator. The fuse link is attached to the starter relay. The insulation on the wire reads: Fuse Link. A melted fuse link can usually be identified by cracked or bubbled insulation. If it is difficult to determine if the fuse link is melted, connect a test light to both ends of the wire. If the fuse link is not melted, the test light will light showing that an open circuit does not exist in the wire.



Fuse Link Installation

Fuse Link Replacement

Fuse links originally installed in your car are black on 1970–71 models and the color of the circuit being protected on 1972 and later models. Service replacements are green or black, depending on usage. Black service replacements are used with cars using 38 and 42 amp alternators, and green service replacements on cars using 55 or 61 amp alternators. All 1972 and later models use color coded flags molded on the wire or on the terminal insulator to identify the wire gauge of the link. Color identification is as follows: Red-18 gauge wire, orange-16 gauge wire, green-14 gauge wire.

1. Disconect the negative battery cable.
2. Disconnect the eyelet of the fuse link from the starter relay.
3. Cut the other end of the fuse link from the wiring harness at the splice.

4. Connect the eyelet end of a new fuse link to the starter relay.

NOTE: *Use only an original equipment type fuse link. Under no conditions should standard wire be substituted.*

5. Splice the open end of the new fuse link into the wiring harness.

6. Solder the splice with rosin-core solder and wrap the splice with electrical tape. This splice must be soldered.

7. Connect the negative battery cable.

8. Start the engine, to check to see that the new connections complete the circuit.

VOLTAGE REGULATOR

The voltage regulator is an electromechanical device which controls the output of the alternator. If the regulator did not limit the voltage output of the alternator, the excessive output could burn out the components of the electrical system. In addition, the regulator compensates for seasonal temperature changes as they affect voltage output.

The voltage regulator is preset at the factory and is not adjustable.

Removal and Installation

1. Remove the battery ground cable. On models with the regulator mounted behind the battery, it is necessary to remove the battery hold-down, and to move the battery.

2. Remove the regulator mounting screws.

3. Disconnect the regulator from the wiring harness.

4. Connect the new regulator to the wiring harness.

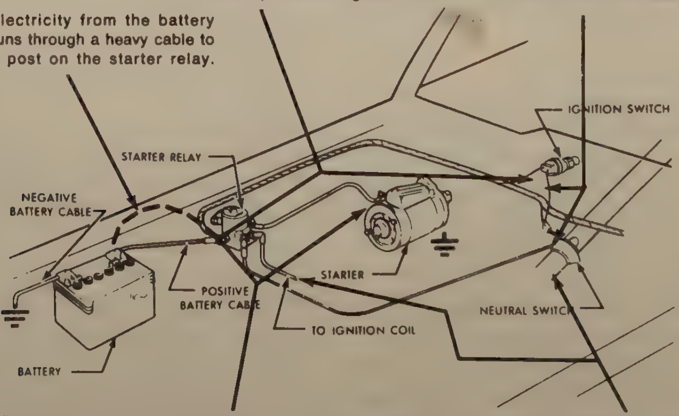
5. Mount the regulator to the regulator mounting plate. The radio suppression condenser mounts under one mounting screw; the ground lead under the other mounting screw. Tighten the mounting screws.

6. If the battery was moved to gain access to the regulator, position the battery and install the hold-down. Connect the battery ground cable, and test the system for proper voltage regulation.

STARTING SYSTEM

The battery is the first link in the chain of mechanisms which work together to provide cranking of the automobile engine. In most modern cars, the battery is a lead-acid electrochemical device consisting of six two-volt (2 V) subsections connected in series so the unit is capable of producing approximately 12 V of electrical pressure. Each subsection, or cell, consists of a series of positive and negative plates held a short distance apart in a solution of sul-

When the ignition switch is turned to the START position, this is what happens:



A. Electricity from the battery runs through a heavy cable to a post on the starter relay.

B. A smaller wire runs from the same post to the ignition switch.

C. When the ignition switch is turned to START position the electricity travels through the switch to the NEUTRAL switch.

D. If the NEUTRAL switch is open the electricity will stop there. If the switch is closed the electricity will continue through the switch and back to the starter relay.

E. When it reaches the starter relay the electricity energizes a small electro-magnet which in turn closes a switch. When the switch is closed it lets the electricity from the battery continue to flow to the starter motor.

Starting System Operation—1970–73

furic acid and water. The two types of plates are of dissimilar metals. This causes a chemical reaction to be set up, and it is this reaction which produces current flow from the battery when its positive and negative terminals are connected to an electrical appliance such as a lamp or motor. The continued transfer of electrons would eventually convert the sulfric acid in the electrolyte to water, and make the two plates identical in chemical composition. As electrical energy is removed from the battery, its voltage output tends to drop. Thus, measuring battery voltage and battery electrolyte composition are two ways of checking the ability of the unit to supply power. During the starting of the engine, electrical energy is removed from the battery. However, if the charging circuit is in good condition and the operating conditions are normal, the power removed from the battery will be replaced by the alternator which will force electrons back through the battery, reversing the normal flow, and restoring the battery to its original chemical state.

The battery and starting motor are linked by very heavy electrical cables designed to minimize resistance to the flow of current. Generally, the major power supply cable that leaves the battery goes directly to the starter, while other electrical system needs are supplied by a smaller cable. During starter operation, power flows from the battery to the starter and is grounded through the car's frame and the battery's negative ground strap.

The starting motor is a specially designed, direct current electric motor capable of producing a very great amount of power for its size. One thing that allows the motor to produce a great deal of power is its tremendous rotating speed. It drives the engine through a tiny pinion gear (attached to the starter's armature), which drives the very large flywheel ring gear at a greatly reduced speed. Another factor allowing it to produce so much power it that only intermittent operation is required of it. Thus, little allowance for air circulation is required, and the windings can be built into a very small space.

The starter solenoid is a magnetic device which employs the small current supplied by the starting switch circuit of the ignition switch. This magnetic action moves a plunger which mechanically engages the starter.

Ford starters employ a separate relay, mounted away from the starter, to switch the motor and solenoid current on and off. The relay thus replaces the solenoid electrical switch, but does not eliminate the need for a solenoid mounted on the starter used to mechanically engage the starter drive gears. The relay is used to reduce the amount of current the starting switch must carry.

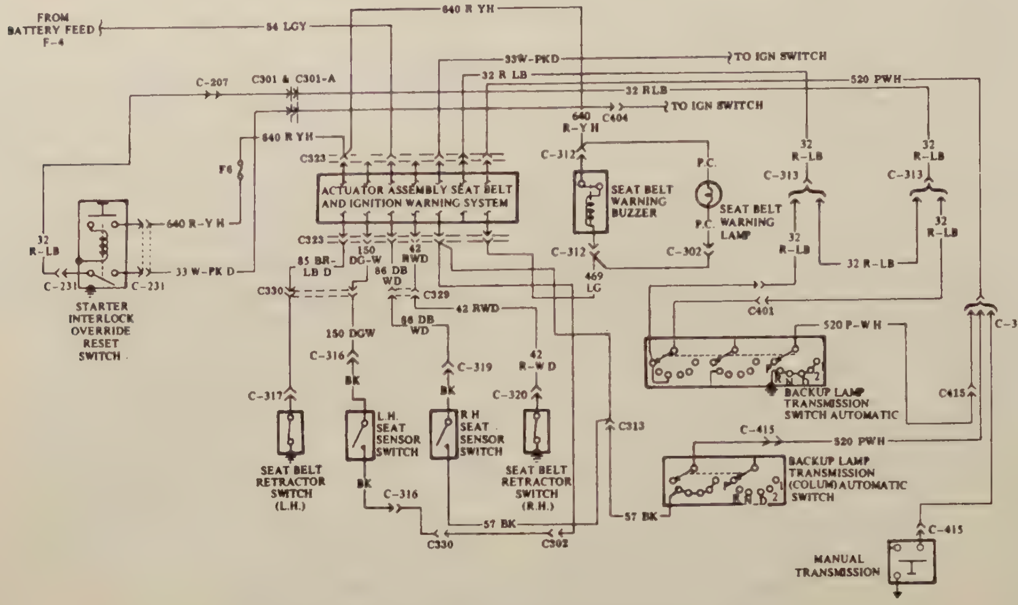
The starting switch circuit consists of the starting switch contained within the ignition switch, a transmission neutral safety switch or clutch pedal switch which prevents the car from being started in any gear but Neutral or Park (automatic only), and the wiring necessary to connect these in series with the starter solenoid or relay.

A pinion, which is a small gear, is mounted to a one-way drive clutch. This clutch is splined to the starter armature shaft. When the ignition switch is moved to the "start" position, the solenoid plunger slides the pinion toward the flywheel ring gear via a collar and spring. If the teeth on the pinion and flywheel match properly, the pinion will engage the flywheel immediately. If the gear teeth butt one another, the spring will be compressed and will force the gears to mesh as soon as the starter turns far enough to allow them to do so. As the solenoid plunger reaches the end of its travel, it closes the contacts that connect the battery and starter and then the engine is cranked.

As soon as the engine starts, the flywheel ring gear begins turning fast enough to drive the pinion at an extremely high rate of speed. At this point, the one-way clutch begins allowing the pinion to spin faster than the starter shaft so that the starter will not operate at excessive speed. When the ignition switch is released from the starter position, the solenoid is de-energized, and a spring contained within the solenoid assembly pulls the gear out of mesh and interrupts the current flow to the starter.

SEAT BELT/STARTER INTERLOCK SYSTEM—1974–75

On all 1974 and some early 1975 models, a starter interlock system is employed consisting of a warning light, buzzer, seat sen-


FROM BATTERY FEED F-4
54 LGY
640 R YH
33W-PKD
TO IGN SWITCH
32 R LB
32 RLB
520 PWH
TO IGN SWITCH
C-207
C301 & C301-A
640 R-Y H
C404
640 R YH
C323
F6
ACTUATOR ASSEMBLY SEAT BELT AND IGNITION WARNING SYSTEM
C-312
SEAT BELT WARNING BUZZER
P.C.
SEAT BELT WARNING LAMP
C-302
32 R-LB
C-313
640 R-Y H
32 R-LB
C-231
33 W-PK D
STARTER INTERLOCK OVERRIDE RESET SWITCH
85 BR-LB D
150 DG-W
42 RWD
86 DB WD
C330
C329
42 RWD
469 LG
C401
520 P-W H
C-313
150 DGW
86 DB WD
C-316
C-319
42 R-W D
BK
C-320
C-317
BACKUP LAMP TRANSMISSION SWITCH AUTOMATIC
C415
L.H. SEAT SENSOR SWITCH
R H SEAT SENSOR SWITCH
C313
C-415
520 PWH
SEAT BELT RETRACTOR SWITCH (L.H.)
SEAT BELT RETRACTOR SWITCH (R.H.)
BACKUP LAMP TRANSMISSION (COLUMN) AUTOMATIC SWITCH
C-316
57 BK
57 BK
C330
C302
C-415
MANUAL TRANSMISSION

Seat Belt/Starter Interlock System Circuit—1974–75

sors, switches in the outboard belt retractors, and an electronic logic module. Basically, the starter will not engage unless the driver and other front seat passenger sit in the seat and pull out the seat belt. Unless the driver or passenger has remained seated and buckled, the sequence must be repeated every time the engine is started. Leaving the belts pulled all the way out also will prevent the engine from being started, as the belts must be retracted and buckled each time the engine is started. In the event of a starter interlock system failure, or to permit the use of a remote starter switch when working under the hood, a starter interlock by-pass switch is located in the engine compartment on the left wheel well, thereby eliminating the need to perform the buckling sequence.

NOTE: *Each time the by-pass switch is operated, the buckling sequence may be eliminated once and once only. The system may not be permanently by-passed using the switch.*

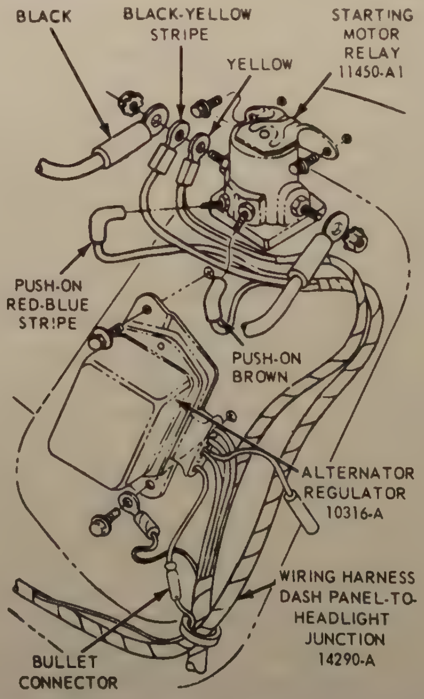
STARTER

Removal and Installation

1. On models equipped with a 302 V8, raise the front of the car and position jack stands beneath the car at the front jacking points.
2. Disconnect the negative battery cable.
3. Disconnect the starter cable at the starter terminal.
4. Remove the 3 starter mounting bolts and withdraw the starter.

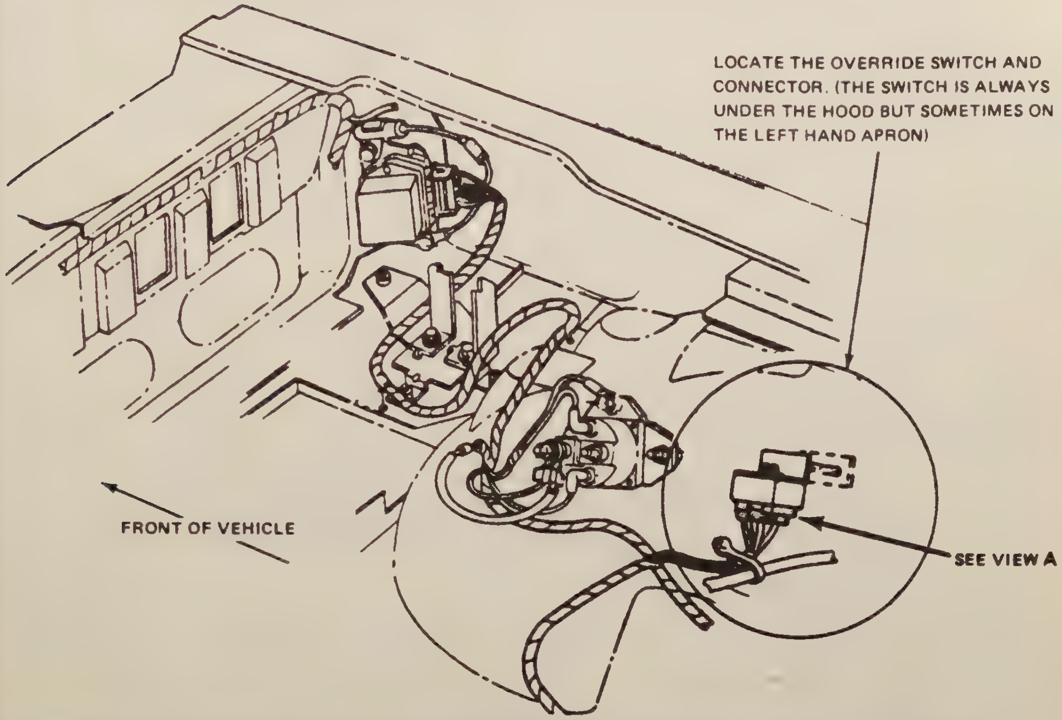
NOTE: *It may be necessary to turn the front wheels to one side so that the starter clears the steering linkage.*

5. To install, position the starter assembly to the flywheel housing and screw the mounting bolts in by hand.

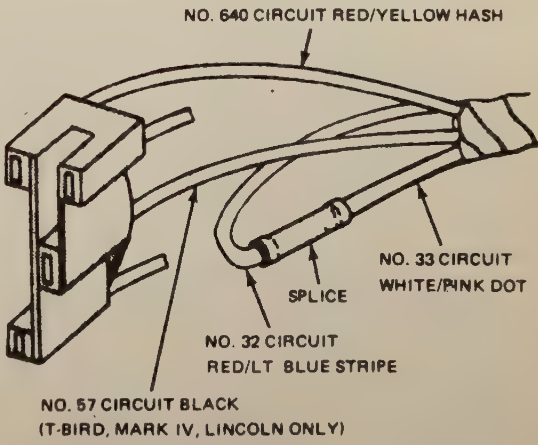

BLACK
BLACK-YELLOW STRIPE
YELLOW
STARTING MOTOR RELAY 11450-A1
PUSH-ON RED-BLUE STRIPE
PUSH-ON BROWN
ALTERNATOR REGULATOR 10316-A
WIRING HARNESS DASH PANEL-TO-HEADLIGHT JUNCTION 14290-A
BULLET CONNECTOR

Starter Relay and Voltage Regulator Harness Connections—1970–71

STARTER INTERLOCK DELETION – ALL VEHICLES SO EQUIPPED – 1974-75


LOCATE THE OVERRIDE SWITCH AND CONNECTOR. (THE SWITCH IS ALWAYS UNDER THE HOOD BUT SOMETIMES ON THE LEFT HAND APRON)
FRONT OF VEHICLE
SEE VIEW A

CAUTION: SET THE PARKING BRAKE AND REMOVE THE IGNITION KEY BEFORE ANY REWORK IS PERFORMED.
(IF THE NO. 640 CIRCUIT IS ACCIDENTALLY SPLICED INTO THE NO. 32 OR NO. 33 CIRCUITS, THE CAR WILL START IN GEAR)


NO. 640 CIRCUIT RED/YELLOW HASH
NO. 33 CIRCUIT WHITE/PINK DOT
SPLICE
NO. 32 CIRCUIT RED/LT BLUE STRIPE
NO. 57 CIRCUIT BLACK (T-BIRD, MARK IV, LINCOLN ONLY)

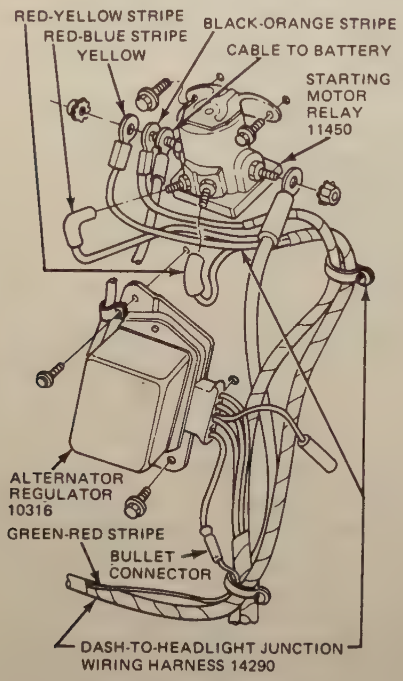
VIEW A

1. CUT THE NO. 32 AND NO. 33 CIRCUITS. *
2. ON THE WIRING HARNESS END, SPLICE THE NO. 32 AND NO.33 CIRCUITS TOGETHER. USE A B9A-14487-A BUTT CONNECTOR ON A 16 TO 18 GAGE WIRE OR A B9A-14487-B CONNECTOR ON A 10 TO 14 GAGE WIRE.
3. TAPE THE COMPLETE SPLICE TO WATER PROOF THE CONNECTION.
4. REATTACH THE CONNECTOR TO THE OVERRIDE SWITCH TO PREVENT RATTLING.
5. TEST THE REWORK BY **SETTING THE CAR BRAKES**, BUCKLE UP THE SEAT BELT AND TURN THE KEY TO ON. IF THE STARTER CRANKS IN THE **ON POSITION** AND IN ANY GEAR THE WIRES HAVE BEEN CROSSED. (RECHECK THE REWORK).
6. THE BUZZER FUNCTION CAN BE DELETED BY REMOVING THE BUZZER FROM THE CONNECTOR AND TAPING THE CONNECTOR TO THE HARNESS TO PREVENT RATTLING.
7. THE SEQUENTIAL SEAT BELT WARNING LIGHT FEATURE CAN BE DELETED BY REMOVING THE BULB FROM ITS SOCKET. THIS CAN ONLY BE DONE ON PREVIOUSLY SOLD VEHICLES. THE LIGHT CANNOT BE DISCONNECTED ON A NEW AND UNSOLD CAR EVEN IF THE PURCHASER SO REQUESTS .

NOTE: IF THE NO. 32 AND NO. 33 CIRCUIT TERMINALS CONTAIN TWO WIRES, CUT AND SPLICE ALL WIRES FROM THE NO. 32 AND NO. 33 CIRCUITS INTO ONE BUTT CONNECTOR:

Battery and Starter Specifications

BATTERY				STARTER							
					Lock Test			No-Load Test			
Year	*Ampere Hour Capacity*	*Volts*	*Ground*	*Starter Diameter (in.)*	*Amps*	*Volts*	*Torque (ft lbs)*	*Amps*	*Volts*	*@ RPM*	*Brush Spring Tension (oz)*
1970–73	45, 55	12	Neg	4	460	5	9.0	50	12	9,500	40
				4½	670	5	15.5	70	12	9,500	40
1974–76	41, 53	12	Neg	4	460	5	9.0	50	12	9,500	40
				4½	670	5	15.5	70	12	9,500	40



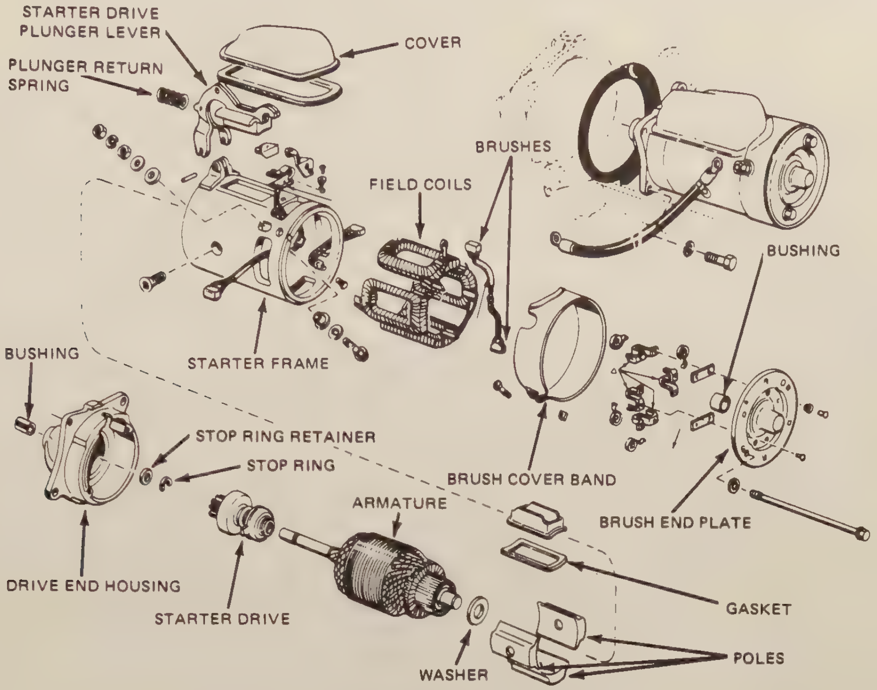
Starter Relay and Voltage Regulator Harness Connections—1972–76

6. Snug the bolts while holding the starter squarely against its mounting surface, making sure that it is fully inserted into its pilot hole. Torque the mounting bolts to 55–75 ft lbs.

7. Connect the starter cable. If raised, lower the vehicle. Connect the negative battery cable.

Starter Drive Replacement

1. Remove the starter from the engine.
2. Remove the brush cover band.
3. Remove the starter drive plunger lever cover.
4. Loosen the thru-bolts just enough to allow removal of the drive end housing and the starter drive plunger lever return spring.
5. Remove the pivot pin which attaches the starter drive plunger lever to the starter frame and remove the lever.
6. Remove the stop ring retainer and stop-ring from the armature shaft.
7. Remove the starter drive from the armature shaft.
8. Inspect the teeth on the starter drive. If they are excessively worn, inspect the teeth on the ring gear of the flywheel. If the teeth on the flywheel are excessively worn, the flywheel should be replaced.
9. Apply a thin coat of white grease to the armature shaft, in the area in which the starter drive operates.
10. Install the starter drive on the armature shaft and install a new stop-ring.
11. Position the starter drive plunger lever on the starter frame and install the pivot pin. *Make sure the plunger lever is properly engaged with the starter drive.*
12. Install a new stop ring retainer on the armature shaft.
13. Fill the drive end housing bearing fore ¼ full with grease.
14. Position the starter drive plunger lever return spring and the drive end housing to the starter frame.
15. Tighten the starter thru-bolts to 55–75 in. lbs.
16. Install the starter drive plunger lever cover and the brush cover band on the starter.
17. Install the starter.


STARTER DRIVE PLUNGER LEVER
COVER
PLUNGER RETURN SPRING
BRUSHES
FIELD COILS
BUSHING
BUSHING
STARTER FRAME
STOP RING RETAINER
STOP RING
BRUSH COVER BAND
ARMATURE
BRUSH END PLATE
DRIVE END HOUSING
STARTER DRIVE
GASKET
POLES
WASHER

Positive Engagement Starter Disassembled

BATTERY

Removal and Installation

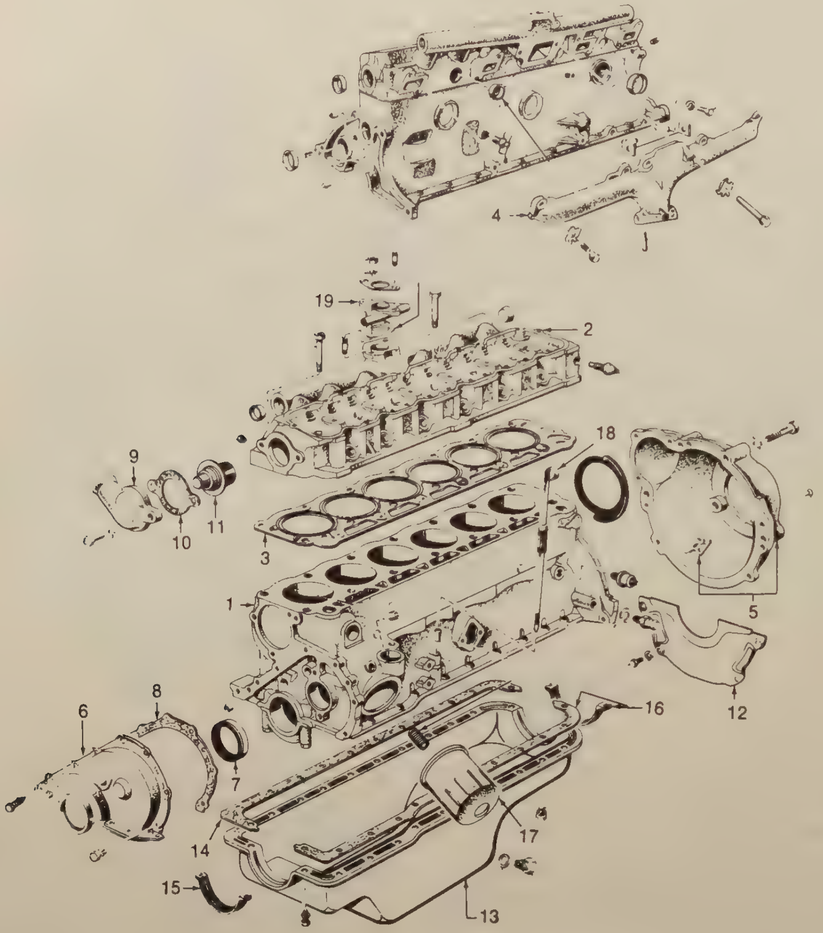
1. Loosen the battery cable bolts and spread the ends of the battery cable terminals.
2. Disconnect the negative battery cable first.
3. Disconnect the positive battery cable.
4. Remove the battery hold-down.
5. Wearing heavy gloves, remove the battery from under the hood. *Be careful not to tip the battery and spill acid on yourself or the car during removal.*
6. To install, wearing heavy gloves, place the battery in its holder under the hood. *Use care not spill the acid.*
7. Install the battery hold-down.
8. Install the positive battery cable first.
9. Install the negative battery cable.
10. Apply a *light* coating of grease to the cable ends.

Engine Mechanical

Four different engines have been available in Mavericks and Comets from 1970 to the present. These include the 170, 200, and 250 six-cylinder engines and the 302 V8. When first introduced in April of 1969, the Maverick was available with only the two smaller sixes. However, with increasing customer demand, the 250 six-cylinder engine was added to the line for the regular September model introduction. When the Comet was introduced late in 1970, it was decided to give the Mercury version something extra, and so an optional 302 V8 was added. Well, Maverick lovers were not to be outdone by Comets with both 302 V8s and power dome hoods, so for 1972, V8 power was offered in Mavericks, too. In 1973, the economy leading 170 six-cylinder engine was dropped—a victim of power-robbing emissions equipment.

All 3 six-cylinder engines are conventional, understressed designs—inline, overhead valve, water-cooled and cast iron construction. An interesting feature on these engines is the fact that the intake manifold is cast as an integral part of the cylinder head. The 170 six has 5 main bearings and the 200 and 250 sixes have 7. Otherwise, the only difference between the powerplants is their bore and stroke.

The 302 V8 is a remarkably compact little powerplant featuring stud-mounted



Exploded View—170, 200 and 250 Six-Cylinder Engines

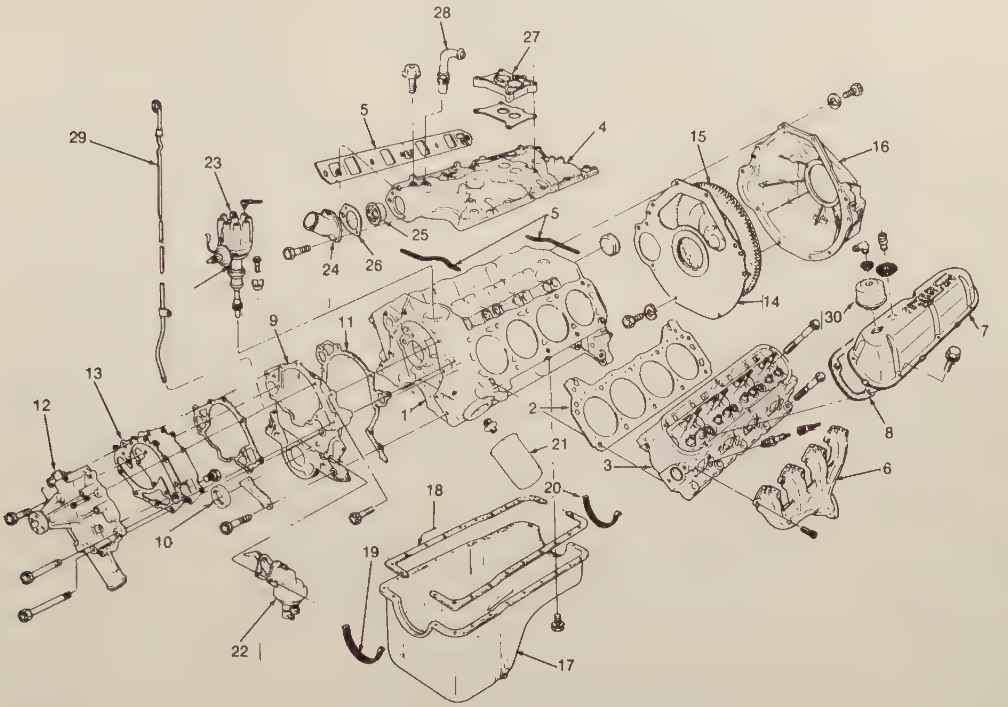
1. Cylinder block
2. Cylinder head and intake manifold assembly
3. Cylinder head gasket
4. Exhaust manifold
5. Flywheel housing
6. Front cover
7. Front cover seal
8. Front cover gasket
9. Thermostat housing
10. Thermostat housing gasket
11. Thermostat
12. Flywheel inspection cover
13. Oil pan
14. Oil pan gasket
15. Front main seal
16. Rear main seal
17. Oil filter
18. Dipstick
19. Carburetor spacer

rocker arms and wedged shaped combustion chambers. It, too, is of cast iron construction and water-cooled. It has 5 main bearings.

ENGINE REMOVAL AND INSTALLATION

170, 200, AND 250 SIX-CYLINDER

Remove the front hood and drain the crankcase and cooling system. Disconnect the closed crankcase ventilation hose and remove the air cleaner. On models so equipped, disconnect those parts of the Thermactor emission control system that might interfere with engine removal. See Chapter 4 for details. Remove the battery ground cable from its connections at the cylinder head and battery. Remove the upper radiator hose from its connection at the water outlet housing and disconnect the lower radiator hose from the water pump. If the car is equipped with automatic transmission, it will be necessary to disconnect the transmission oil cooler lines from the radiator. Remove the radiator, fan, spacer, belt and pulley. Remove the heater hoses from their connections at the water pump and engine block. Disconnect the alternator wires, starter cable, accelerator



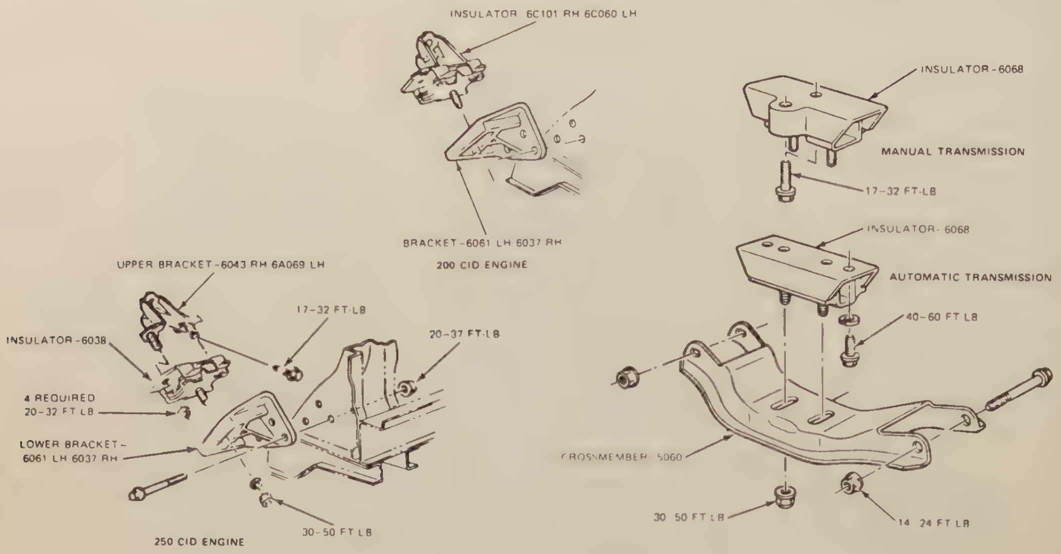
Exploded View—302 V8 Engine

1. Cylinder block
2. Cylinder head gasket
3. Cylinder head
4. Intake manifold
5. Intake manifold gasket
6. Exhaust manifold
7. Valve cover
8. Valve cover gasket
9. Front cover
10. Front cover seal
11. Front cover gasket
12. Water pump
13. Water pump gasket
14. Rear cover plate
15. Flywheel
16. Flywheel housing
17. Oil pan
18. Oil pan gasket
19. Front main seal
20. Rear main seal
21. Oil filter
22. Fuel pump
23. Distributor
24. Thermostat housing
25. Thermostat
26. Thermostat gasket
27. Carburetor spacer
28. Heater hose fitting
29. Dipstick
30. Filler cap

rod and choke control cable. If the car is equipped with air conditioning, remove the compressor from its mounting bracket and set aside. (*NOTE: The refrigerant lines must remain attached.*) Disconnect the flexible fuel line from its connection at the fuel tank line and plug the line from the fuel tank. Disconnect the primary wire from the coil and remove the wires from the sending units of the oil pressure and water temperature indicators. Remove the starter along with its dust seal. If the car is equipped with a manual transmission, disconnect the clutch retracting spring, clutch equalizer shaft and bracket from beneath the car and remove the bracket and equalizer shaft.

Raise the vehicle on a suitable lift and, using the access holes provided in the underbody, remove the upper attaching bolts of the flywheel or converter housing. Disconnect the muffler inlet pipe at the exhaust manifold and loosen the clamp securing the inlet pipe and slide it from its support bracket on the engine. Disconnect the engine right and left mount at the underbody bracket and remove the flywheel or converter housing cover. If the car is equipped with a manual transmission, remove the flywheel housing lower attaching bolts. If the car is equipped with automatic transmission, disconnect the converter from the flywheel and remove the lower attaching bolts of the converter housing. Lower the vehicle and use a jack to support the transmission and flywheel or converter housing. Attach an engine lifting hook and carefully lift the engine from its compartment.

To install the engine, set guide pins in the flywheel or converter housing bolt holes at the rear of the engine. Place a new gas-


INSULATOR 6C101 RH 6C060 LH
INSULATOR-6068
MANUAL TRANSMISSION
17-32 FT-LB
BRACKET-6061 LH 6037 RH
200 CID ENGINE
INSULATOR- 6068
AUTOMATIC TRANSMISSION
UPPER BRACKET-6043 RH 6A069 LH
17-32 FT-LB
20-37 FT-LB
40-60 FT LB
INSULATOR-6038
4 REQUIRED
20-32 FT LB
LOWER BRACKET-
6061 LH 6037 RH
CROSSMEMBER 5060
30 50 FT LB
14 24 FT LB
30-50 FT LB
250 CID ENGINE

Six-Cylinder Engine Front and Rear Supports

General Engine Specifications

Year	*Engine Cu in. Displacement*	*Carburetor Type*	*Horsepower @ rpm °*	*Torque @ rpm ° (ft lbs)*	*Bore x Stroke (in.)*	*Compression Ratio*	*Oil Pressure (Hot) @ 2000 rpm (psi)*
1970	170	1 bbl	105 @ 4400	158 @ 2400	3.500 x 2.940	8.7 : 1	35–60
	200	1 bbl	120 @ 4400	190 @ 2400	3.680 x 3.130	8.7 : 1	35–60
	250	1 bbl	155 @ 4400	240 @ 1600	3.682 x 3.910	9.0 : 1	35–60
1971	170	1 bbl	100 @ 4200	148 @ 2600	3.500 x 2.940	8.7 : 7	35–60
	200	1 bbl	115 @ 4000	180 @ 2200	3.680 x 3.130	8.7 : 1	35–60
	250	1 bbl	145 @ 4000	232 @ 1600	3.682 x 3.910	9.0 : 1	35–60
	302	2 bbl	210 @ 4600	296 @ 2600	4.000 x 3.000	9.0 : 1	35–60
1972	170	1 bbl	82 @ 4400	129 @ 1800	3.500 x 2.940	8.3 : 1	35–60
	200	1 bbl	91 @ 4000	154 @ 2200	3.680 x 3.130	8.3 : 1	35–60
1972	250	1 bbl	99 @ 3600	184 @ 1600	3.680 x 3.910	8.0 : 1	35–60
	302	2 bbl	141 @ 4000	242 @ 2000	4.000 x 3.000	8.5 : 1	35–60
1973–74	200	1 bbl	84 @ 3600	151 @ 1800	3.680 x 3.130	8.3 : 1	30–50

General Engine Specifications (cont.)

Year	Engine Cu in. Displacement	Carburetor Type	Horsepower @ rpm *	Torque @ rpm * (ft lbs)	Bore x Stroke (in.)	Compression Ratio	Oil Pressure (Hot) @ 2000 rpm (psi)
1973–74	250	1 bbl	89 @ 3200①	196 @ 1600①	3.680 x 3.910	8.0 : 1	40–60
	302	2 bbl	138 @ 4200	234 @ 2200	4.000 x 3.000	8.0 : 1	40–60
1975	200	1 bbl	74 @ 3400②	132 @ 2400②	3.680 x 3.130	8.3 : 1	30–50
	250	1 bbl	72 @ 2900③④	180 @ 1400③④	3.680 x 3.910	8.0 : 1	40–60
	302	2 bbl	122 @ 3800⑤	208 @ 1800⑤	4.000 x 3.000	8.0 : 1	40–60
1976	200	1 bbl	78 @ 3300⑥	152 @ 1600⑥	3.680 x 3.130	8.3 : 1	30–50
	250	1 bbl	81 @ 3000⑦⑧	192 @ 2000⑦⑧	3.680 x 3.910	8.0 : 1	40–60
	302	2 bbl	137 @ 3600⑨	246 @ 1800⑨	4.000 x 3.000	8.0 : 1	40–60

[*] 1970–71 horsepower and torque figures are gross figures obtained with the engine on a dynamometer with drive accessories not attached.
1972–76 horsepower and torque figures are net figures obtained with the engine installed in the vehicle with drive accessories attached.

① Figures listed above for models equipped with 250 six and manual transmission. Models with automatic transmission have 93 hp @ 3200 rpm and 200 ft lbs torque @ 1400 rpm.

② On manual transmission cars, 75 hp @ 3200 rpm and 145 ft lbs torque @ 2000 rpm

③ On manual transmission cars, 85 hp @ 2900 rpm and 180 ft lbs torque @ 2000 rpm

④ On California cars, 70 hp @ 2800 rpm and 175 ft lbs torque @ 1400 rpm

⑤ On California cars, 115 hp @ 3600 rpm and 203 ft lbs torque @ 1400 rpm

⑥ On manual transmission cars, 81 hp @ 3400 rpm and 151 ft lbs torque @ 1700 rpm

⑦ On manual transmission cars, 90 hp @ 3000 rpm and 190 ft lbs torque @ 2000 rpm

⑧ On California cars, 78 hp @ 3000 rpm and 183 ft lbs torque @ 1400 rpm

⑨ On manual transmission cars, 138 hp @ 3600 rpm and 245 ft lbs torque @ 2000 rpm

Valve Specifications

Year	Engine Cu in. Displacement	Seat Angle (deg)	Face Angle (deg)	Spring Test Pressure (lbs @ in.)	Spring Installed Height (in.)	Stem-To-Guide Clearance (in.)		Stem Diameter (in.)	
						Intake	Exhaust	Intake	Exhaust
1970–71	170, 200, 250	45	44	150 @ 1.22	$1\frac{19}{32}$	.0008–.0025	.0010–.0027	.3104	.3102
	302	45	44	180 @ 1.23	$1\frac{21}{32}$	.0010–.0027	.0015–.0032	.3104	.3415

Valve Specifications (cont.)

Year	*Engine Cu in. Displacement*	*Seat Angle (deg)*	*Face Angle (deg)*	*Spring Test Pressure (lbs @ in.)*	*Spring Installed Height (in.)*	*Stem-To-Guide Clearance (in.)*		*Stem Diameter (in.)*	
						Intake	*Exhaust*	*Intake*	*Exhaust*
1972	170, 200, 250	45	44	all intake; 170, 200 exhaust— 150 @ 1.22 250 exhaust— 150 @ 1.18	$1\frac{19}{32}$	.0008– .0027	.0010– .0027	.3104	.3102
	302	45	44	200 @ 1.31	$1\frac{11}{16}$	.0010– .0027	.0015– .0032	.3420	.3415
1973	200, 250	45	44	all intake—146 @ 1.20 200 exh—153 @ 1.21 250 exh—148 @ 1.18	$1\frac{19}{32}$	.0008– .0025	.0010– .0027	.3104	.3102
	302	45	44	200 @ 1.31	$1\frac{11}{16}$	.0010– .0027	.0015– .0032	.3420	.3415
1974–76	200, 250	45	44	all intake—150 @ 1.18 200 exh—150 @ 1.21 250 exh—150 @ 1.18	$1\frac{19}{32}$	.0008– .0025	.0010– .0027	.3104	.3102
	302	45	44	intake—200 @ 1.31 exhaust—195 @ 1.27	int—$\frac{11}{16}$ exh—$\frac{9}{16}$	.0010– .0027	.0015– .0032	.3420	.3415

Crankshaft and Connecting Rod Specifications

(All Measurements are given in in.)

Year	*Engine Cu in. Displacement*	*Crankshaft*				*Connecting Rod*		
		Main Bearing Journal Dia.	*Main Bearing Oil Clearance*	*Shaft End-Play*	*Thrust on No.*	*Journal Diameter*	*Oil Clearance*	*Side Clearance*
1970–71	170	2.2482– 2.2490	.0005– .0022	.004– .008	3	2.1232– 2.1240	.0008– .0024	.003– .010
	200	2.2482– 2.2490	.0005– .0022	.004– .008	5	2.1232– 2.1240	.0008– .0024	.003– .010
	250	2.3982– 2.3990	.0005– .0022	.004– .008	5	2.1232– 2.1240	.0008– .0034	.003– .010
	302	2.2482– 2.2490	.0005– .0024 ①	.004– .008	3	2.1228– 2.1236	.0008– .0026	.010– .020

Crankshaft and Connecting Rod Specifications (cont.)

(All Measurements are given in in.)

		Crankshaft				*Connecting Rod*		
Year	*Engine Cu in. Displacement*	*Main Bearing Journal Dia.*	*Main Bearing Oil Clearance*	*Shaft End-Play*	*Thrust on No.*	*Journal Diameter*	*Oil Clearance*	*Side Clearance*
1972–76	170	2.2482–2.2490	.0008–.0024	.004–.008	3	2.1232–2.1240	.0008–.0024	.003–.010
	200	2.2482–2.2490	.0008–.0024	.004–.008	5	2.1232–2.1240	.0008–.0024	.003–.010
	250	2.3982–2.3990	.0008–.0024	.004–.008	5	2.1232–2.1240	.0008–.0024	.003–.010
	302	2.2482–2.2490	.0005–.0024	.004–.008	3	2.1228–2.1236	.0008–.0026	.010–.020

① 302—.001–.0018 No. 1 bearing only.

Piston and Ring Specifications

(All measurements in in.)

			Ring Gap			*Ring Side Clearance*			
Year	*Engine Cu in. Displacement*	*Piston Clearance*	*Top Compression*	*Bottom Compression*	*Oil Control*	*Top Compression*	*Bottom Compression*	*Oil Control*	*Wear Limit*
1970–71	170, 200, 250	0.0013–0.0021	0.010–0.020	0.010–0.020	0.015–0.005	0.002–0.004	0.002–0.004	Snug	0.006
	302	0.0018–0.0026	0.010–0.020	0.010–0.020	0.015–0.069	0.002–0.004	0.002–0.004	Snug	0.006
1972	170, 200, 250	0.0012–0.0021	0.010–0.020	0.010–0.020	0.015–0.055	0.002–0.004	0.002–0.004	Snug	0.006
	302	0.0018–0.0026	0.010–0.020	0.010–0.020	0.015–0.055	0.002–0.004	0.002–0.004	Snug	0.006
1973–76	200, 250	0.0013–0.0021	0.008–0.016	0.008–0.016	0.015–0.055	0.002–0.004	0.002–0.004	Snug	0.006
	302	0.0018–0.0026	0.010–0.020	0.010–0.020	0.015–0.055	0.002–0.004	0.002–0.004	Snug	0.006

Torque Specifications

(All readings in ft lbs)

Year	Engine Cu in. Displacement	Cylinder Head Bolts	Rod Bearing Bolts	Main Bearing Bolts	Crankshaft Pulley Bolt	Flywheel-To-Crankshaft Bolts	Manifold		Oil Pan	Valve Cover
							Intake	Exhaust		
1970–76	170, 200, 250	70–75	19–24①	60–70	85–100	75–85	——	13–18	7–9	3–5
1971–76	302	65–72	19–24	60–70	70–90	75–85	23–25	12–16②	7–9	3.5

① 250 six—21–26 ft lbs.
② 1975–76 models—18–24 ft lbs.

ket over the studs of the exhaust manifold. Carefully lower the engine into its compartment, being sure that the studs on the exhaust manifold are lined up with the holes in the muffler inlet pipe and that the guide pins in the engine block engage the holes in the flywheel or converter housing. If the car is equipped with an automatic transmission, start the converter pilot into the crankshaft.

If the car is equipped with a manual transmission, start the transmission main drive gear into the clutch disc. In order to facilitate the preceding, it may be necessary to adjust the position of the transmission relative to the engine so that the input shaft can enter the disc. If the engine should hang up after the shaft enters, place the transmission in gear and turn the crankshaft slowly until the shaft splines line up with the disc splines.

Remove the engine lifting hook and install the upper attaching bolts of the flywheel or converter housing. Remove the jack from the transmission and raise the vehicle on a lift. Remove the guide pins and install the lower attaching bolts of the flywheel or converter housing. If the car is equipped with automatic transmission, attach the converter to the flywheel and tighten the attaching nuts to the proper torque (23–28 ft lbs). Install the flywheel or converter housing dust cover. If the car is equipped with manual transmission, install the clutch equalizer shaft and arm bracket and connect the clutch retracting spring. Install the engine left and right mount to the underbody bracket. Remove the plug from the fuel tank line and replace the flexible fuel line to the tank line. Use the lock washers and nuts to install the exhaust manifold to the muffler inlet pipe. Position and tighten the clamp securing the inlet pipe to the support bracket on the engine.

With the vehicle lowered, replace the oil pressure and water temperature sending unit wires, connect the coil primary wire, accelerator rod, and choke control cable. Install the starter motor and its dust seal. Connect the starter cable. Replace the heater hoses to the water pump and engine block and attach the alternator wires and the battery ground cable. Install the fan pulley, fan, and drive belt and adjust the drive belt tension. If the car is equipped with air conditioning, install the compressor to its mounting bracket and adjust the belt tension. Install the radiator and replace the upper and lower hoses to the water outlet housing and water pump housing. Fill and bleed the cooling system and fill the crankcase with oil of the proper type.

Install and adjust the front hood and operate the engine at a fast idle while checking all gaskets and hose connections for leaks. If the car is equipped with automatic transmission, adjust the transmission control linkage. Install the air cleaner and connect the hose for the positive closed crankcase ventilation system. If new drive belts have been installed, recheck their tension after a ten minute running period.

302 V8

NOTE: *On cars equipped with air conditioning, it will be necessary to isolate and remove the compressor. As this operation requires special equipment and skills, this step is best referred to an air conditioning serviceman. Attempts to isolate the compressor and remove the pressurized refrigerant yourself may result in injury.*

1. Scribe the outline of the hood hinges on the hood, and remove the hood.

2. Drain the cooling system and the crankcase.

3. Disconnect the battery and alternator ground cable from the engine.

4. Remove the air cleaner and intake duct assembly.

5. Disconnect the upper radiator hose at the thermostat housing and the lower hose at the water pump. On models so equipped, disconnect those parts of the Thermactor emission control system that may interfere with engine removal.

6. If the car is equipped with automatic transmission, disconnect and plug the transmission cooler lines at the radiator.

7. Remove the bolts attaching the fan shroud to the radiator, if so equipped. Remove the radiator, fan, spacer, belt pulley and shroud, if so equipped.

8. Remove the alternator retaining bolts and position the alternator to one side. If the car is equipped with power steering, disconnect the steering pump bracket from the cylinder head, remove the drive belt, and position the pump to one side, taking care not to spill fluid.

9. Disconnect the oil pressure and water temperature sending unit wires at their sending units.

10. Disconnect and plug the fuel tank line where it attaches to the flexible fuel line.

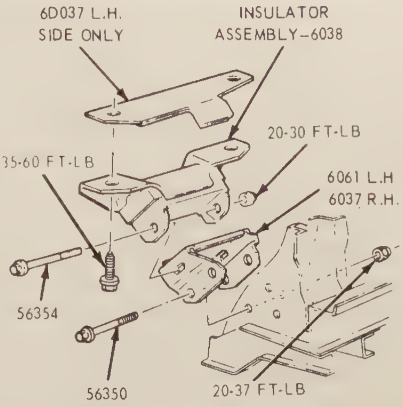
11. Disconnect the accelerator rod at the carburetor. If equipped with automatic transmission, disconnect the throttle valve vacuum line at the intake manifold, the manual shift rod at its retracting spring, and the transmission filler tube bracket at the cylinder block.

12. On a car equipped witih air conditioning, isolate and remove the compressor from the engine compartment.

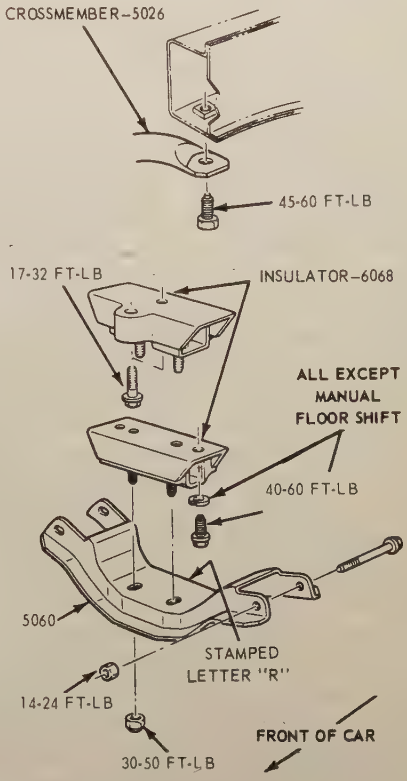
13. Remove the heater hose from the automatic choke housing. Disconnect the heater hoses at the water pump and intake manifold.

14. Remove the flywheel housing (manual transmission) or converter housing (automatic transmission) upper bolts from the engine block.

15. Disconnect the primary wire at the ignition coil. Remove the wire harness from the left valve cover and position the wires to one side. Disconnect the ground strap from the engine block.



302 V8 Engine Front Supports



Six and V8 Engine Rear Supports

16. Raise the front of the car and install jack stands beneath the lower control arms. Disconnect the starter cable and remove the starter.

17. Disconnect the muffler inlet pipes at the exhaust manifolds. Disconnect the front engine supports (mounts) from their brackets on the frame.

18. If equipped with manual transmission, remove the bolts attaching the clutch equalizer shaft to the frame rail and remove the equalizer from the block. Remove the remaining flywheel housing bolts from the engine.

19. If equipped with automatic transmission disconnect the transmission cooler lines at their bracket and remove the converter housing inspection cover. Disconnect the flywheel from the converter. Secure the converter assembly in the housing. Remove the remaining converter housing bolts from the engine.

20. Remove the jack stands. Lower the car, taking care to support the transmission. Install lifting brackets on the exhaust manifolds. Attach an engine lifting sling and hoist to the lifting brackets at the exhaust manifolds.

21. Raise the engine slightly, carefully pulling it from the transmission. Then, carefully lift the engine out of its compartment, taking care not to damage the ears on the converter or the rear cover plate.

22. To install, attach an engine lifting sling and hoist to the lifting brackets at the exhaust manifolds. Support the transmission to ease engine-transmission alignment.

23. Carefully lower the engine into the engine compartment, making sure that the exhaust manifolds properly align with the muffler inlet pipes. If equipped with automatic transmission, start the converter pilot shaft into the crankshaft. If equipped with manual transmission, start the transmission mainshaft into the clutch disc. It is important that the engine and transmission be on the same angle to accomplish this. If the engine hangs up after the shaft enters, slowly turn the crankshaft (with the transmission in gear) until the shaft splines mesh with the clutch disc splines.

24. Install the flywheel or converter housing upper bolts, making sure that the dowels in the block are inserted in the housing.

25. Install the engine mount attaching nuts. Torque to 20–30 ft lbs. Disconnect the lifting apparatus and remove the lifting brackets.

26. Raise the front of the car and install jack stands under the lower control arms. Connect the inlet pipes to the exhaust manifolds and torque the attaching nuts to 25–35 ft lbs. Install the starter and starter cable.

27. If equipped with manual transmission, install the remaining flywheel housing-to-engine bolts. Position the clutch equalizer shaft to the engine block and install the bracket on the frame side rail.

28. If equipped with automatic transmission, remove the retainer holding the converter in the housing. Attach the converter to the flywheel. Install the converter inspection cover. Install the remaining converter housing attaching bolts.

29. Remove the support from under the transmission. Remove the jack stands and lower the vehicle.

30. Connect the wiring harness and coil wire. Connect the water temperature and oil pressure sending unit wires.

31. Install the heater hose on the automatic choke housing and connect the hose to the intake manifold.

32. Connect the accelerator rod and throttle linkage. If equipped with automatic transmission, connect the filler tube bracket, manual shift rod (downshift rod), retracting spring and the throttle valve vacuum line.

33. Remove the plug and connect the fuel line.

34. Install the pulley, drive belt(s), spacer, and fan.

35. Install the alternator and adjust its belt tension. Connect the battery and alternator ground cables. Install the power steering pump, if so equipped, and adjust its belt tension.

36. If equipped with air conditioning, install the compressor and have the system charged with refrigerant.

37. Position the radiator fan shroud, if so equipped, and install the radiator. Connect the upper and lower radiator hoses, and the automatic transmission cooler lines, if so equipped. Install the fan shroud retaining bolts, if so equipped.

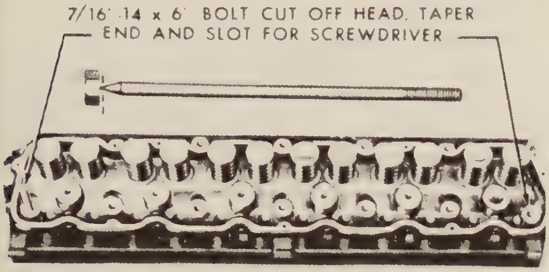
38. Connect the heater hose at the water pump. Fill the cooling system and crankcase. Bleed the cooling system of all trapped air as outlined in Chapter 1 under “Changing Coolant”.

39. Adjust the transmission throttle and downshift linkage as outlined in Chapter 4.

40. Start the engine and operate it at a fast idle. Check for leakage at all gaskets and hose connections.

41. Install the air cleaner and intake duct assembly.

42. Install the hood.


7/16' 14 x 6' BOLT CUT OFF HEAD, TAPER END AND SLOT FOR SCREWDRIVER

Cylinder Head Guide Stud Fabrication

CYLINDER HEAD

170, 200, and 250 Six-Cylinder

Removal

NOTE: *To ease installation, a pair of guide studs may be made from two spare cylinder head bolts.*

1. Open the radiator petcock and the cylinder block drain plug and drain the cooling system. Disconnect the upper radiator hose. Remove the air cleaner. Disconnect the battery cable at the cylinder head.

2. Disconnect the exhaust pipe at the manifold end, lever the exhaust pipe down, and remove the flange gasket.

3. Disconnect and plug the carburetor fuel inlet line at the fuel inlet hose, and the inlet line at the fuel pump. Remove the lines as an assembly.

4. Disconnect the distributor vacuum lines as necessary for accessibility, and mark them for proper installation. Disconnect all other vacuum lines from the carburetor or intake manifold vacuum source, if so equipped.

5. Disconnect the accelerator rod and retracting spring at the carburetor. Disconnect the transmission kickdown rod and accelerator linkage at the bellcrank assembly.

6. Disconnect the spark plug wires at the spark plugs and remove the plugs. Disconnect the temperature sending unit wire at the sending unit.

7. Remove the crankcase ventilation system. Remove the rocker arm (valve) cover.

8. Disconnect the exhaust gas recirculation tube from the exhaust manifold on 1973 and later models.

9. Back off all of the tappet adjusting screws to relieve tension from the rocker shaft. Loosen the rocker arm shaft attaching bolts and remove the rocker arm and shaft assembly. Remove the valve pushrods, in order, and keep them that way.

10. Remove one cylinder head bolt from each end of the head (at opposite corners) and install the cylinder head guide studs. Remove the remaining cylinder head bolts and lift them off the cylinder head.

To help in removal and installation of the cylinder head, two 6 in. x 7/16—14 bolts with the heads cut off and the head end slightly tapered and slotted for installation and removal, with a screwdriver, will reduce the possibility of damage during head replacement. These guide studs make a handy tool during head removal and gasket and head replacement.

Installation

1. Clean the cylinder head and block surfaces. Be sure of flatness and no surface damage.

2. Apply cylinder head gasket sealer to both sides of the new gasket and slide the gasket down over the two guide studs in the cylinder block.

NOTE: *Apply gasket sealer only to steel shim head gaskets. Steel/asbestos composite head gaskets are to be installed without any sealer.*

3. Carefully lower the cylinder head over the guide studs. Place the exhaust pipe flange on the manifold studs (new gasket).

4. Coat the threads of the end bolts for the right side of the cylinder head with a small amount of water-resistant sealer. Install, but do not tighten, two heads bolts at opposite ends to hold the head gasket in place. Remove the guide studs and install the remaining bolts.

5. The cylinder head should be torqued in three steps and in prescribed order. Tighten to 55 ft lbs, then give them a second tightening to 65 ft lbs. The final step is to 75 ft lbs, at which they should remain undisturbed. Tighten the exhaust manifold flange attaching nuts to 13–18 ft lbs.

6. Lubricate both ends of the pushrods and install them in their original locations.

7. Apply a petroleum jelly lubricant to the rocker arm pads and the valve stem tips, and position the rocker arm shaft assembly on the head. Be sure that the oil holes in the shaft are in a down position.

8. Tighten all the rocker shaft retaining bolts to 30–35 ft lbs and do a preliminary valve adjustment (make sure there are no tight valve adjustments). Refer to the pro-

cedures for "Preliminary Valve Lash Adjustment" at the end of the "Cylinder Head" section of this chapter.

9. Hook up the exhaust pipe, using new lockwashers. Tighten the nuts to 12–18 ft lbs.

10. Connect the upper radiator hose.

11. Connect the transmission kickdown rod and accelerator linkage at the bellcrank assembly. Connect the accelerator rod and retracting spring at the carburetor.

12. Connect the distributor vacuum lines as marked prior to removal. Connect all other vacuum lines, if so equipped, to their respective carburetor or intake manifold vacuum source.

13. Connect the fuel line at the fuel filter using a new hose clamp. Connect the fuel inlet line at the fuel pump.

14. Connect the temperature sending unit wire at the sending unit. Lightly lubricate the spark plug threads. Install and tighten the spark plugs to 25 ft lbs. Connect the spark plug wires and make sure that the wires are all the way down in their sockets. Connect the battery cable.

15. Coat one side of a new rocker cover gasket witih oil-resistant sealer. Lay the treated side of the gasket on the cover and install the cover. Make sure that the gasket seals evenly around the cylinder head.

16. Install the crankcase ventilation system. On 1973 and later models, install the exhaust gas recirculation tube to the exhaust manifold. Install the air cleaner.

17. Close the drain plugs and fill the cooling system. Start the engine and bleed the cooling system. Check for coolant and oil leaks.

302 V8

REMOVAL

1. Drain the cooling system.

2. Remove the intake manifold and the carburetor as an assembly, following the procedures under "Intake Manifold Removal."

3. Disconnect the spark plug wires, marking them as to placement. Position them out of the way of the cylinder head. Remove the spark plugs.

4. Disconnect the resonator or muffler inlet pipe(s) at the exhaust manifold(s).

5. Disconnect the battery ground cable at the cylinder head (if applicable).

6. Remove the rocker arm covers.

7. On cars with air conditioning, remove the mounting bolts and the drive belt, and position the compressor out of the way of the cylinder head. Remove the compressor upper mounting bracket from the cylinder head.

CAUTION: *If the compressor refrigerant lines do not have enough slack to permit repositioning of the compressor without first disconnecting the refrigerant lines, the air conditioning system will have to be evacuated by a trained air conditioning serviceman. Under no circumstances should an untrained person attempt to disconnect the air conditioning refrigerant lines.*

8. In order to remove the left cylinder head, on cars equipped with power steering, it may be necessary to remove the steering pump and bracket, remove the drive belt, and wire or tie the pump out of the way, but in such a way as to prevent the loss of its fluid.

9. In order to remove the right head it may be necessary to remove the alternator mounting bracket bolt and spacer, the ignition coil, and the air cleaner inlet duct from the right cylinder head.

10. In order to remove the left cylinder head on a car equipped with a Thermactor exhaust emission control system, disconnect the hose from the air manifold on the left cylinder head.

11. If the right cylinder head is to be removed on a car equipped with a Thermactor exhaust emission control system, remove the Thermactor air pump and its mounting bracket. Disconnect the hose from the air manifold on the right cylinder head.

12. Loosen the rocker arm stud nuts enough to rotate the rocker arms to the side, in order to facilitate the removal of the pushrods. Remove the pushrods in sequence, so they may be installed in their original positions. Remove the exhaust valve stem caps.

13. Remove the cylinder head attaching bolts, noting their positions. Lift the cylinder head off the block. Remove and discard the old cylinder head gasket.

INSTALLATION

1. Clean all surfaces where gaskets are to be installed. These include the cylinder head, intake manifold, rocker arm (valve)

cover, and the cylinder block surfaces. If the head was removed because of a blown head gasket, check the flatness of the cylinder head and engine block surfaces. The method for this checking is outlined in the "Engine Rebuilding" section under "Cylinder Head Reconditioning".

2. Position the new cylinder head gasket over the cylinder dowels on the block. Coat the head bolts with water-resistant sealer. Position new gaskets on the muffler inlet pipes at the exhaust manifold flange.

3. Position the cylinder head to the block, and install the head bolts, each in its original position. On all engines on which the exhaust manifold has been removed from the head to facilitate removal, it is necessary to properly guide the exhaust manifold studs into the muffler inlet pipe flange when installing the head.

4. Step-torque the cylinder head retaining bolts first to 50 ft lbs, then to 60 ft lbs, and finally to the torque specification listed in the "Torque Specifications Chart." Tighten the exhaust manifold-to-cylinder head attaching bolts to specifications.

5. Tighten the nuts on the exhaust manifold studs at the muffler inlet flanges to 18 ft lbs.

6. Clean and inspect the pushrods one at a time. Clean the oil passage within each pushrod with a suitable solvent and blow the passage out with compressed air. Check the ends of the pushrods for nicks, grooves, roughness, or excessive wear. Visually inspect the pushrods for straightness, and replace any bent ones. Do not attempt to straighten pushrods.

7. Install the pushrods in their original positions. Apply Lubriplate or a similar product to the valve stem tips and to the pushrod guides in the cylinder head. Install the exhaust valve stem caps.

8. Apply Lubriplate or a similar product to the fulcrum seats and sockets. Turn the rocker arms to their proper position and tighten the stud nuts enough to hold the rocker arms in position. Make sure that the lower ends of the pushrods have remained properly seated in the valve lifters.

9. Perform a preliminary valve adjustment, as described at the end of the "Cylinder Head" section of this chapter.

10. Apply a coat of oil-resistant sealer to the upper side of a new valve cover gasket. Position the gasket on the valve cover with the cemented side of the gasket facing the valve cover.

11. Install the valve covers. Tighten the bolts to 3–5 ft lbs.

12. Install the intake manifold and carburetor, following the procedure under "Intake Manifold Installation."

13. Refer to steps 6–11 (inclusive) of the "Removal" procedure and reverse the procedures if applicable to your car.

14. Refer to the "Belt Tension Adjustment" procedure in Chapter 1 and adjust all drive belts which were removed.

15. Refill the cooling system.

16. Connect the battery ground cable at the cylinder head (if applicable).

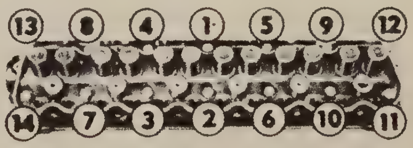
17. Install the spark plugs and connect the spark plug wires.

18. Start the engine and check for leaks.

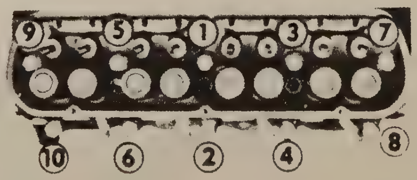
19. With the engine running, check and adjust the carburetor idle speed and mixture as explained in Chapter 2.

20. With the engine running, listen for abnormal valve noises or irregular idle and correct them.

Cylinder Head Torque Sequences



Cylinder Head Torque Sequence—Six-Cylinder Engines



Cylinder Head Torque Sequence—V8 Engine

VALVE GUIDES

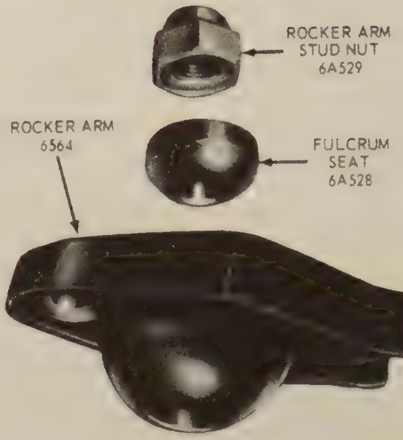
Ford Motor Company engines use integral valve guides. Mercury and Ford dealers offer valves with oversize stems for worn guides. To fit these, enlarge valve guide bores with valve guide reamers to an oversize that cleans up wear. If a large oversize is required it is best to approach that size in stages by using a series of reamers of increasing diameter. This helps to maintain the concentricity of the guide bore with the valve seat. The correct valve guide to stem clearance is at front of this section. As an alternative, some local automotive machine shops will fit replacement guides that use standard stem valves.

ROCKER ARMS

All six-cylinder engines utilize shaft-mounted rocker arm assemblies. Removal and installation procedures for these rocker arm assemblies are included under the "Cylinder Head Removal and Installation" procedure. Remember when installing the rocker shafts that the oil holes must face downward. In all cases, the torque sequence for the rocker shaft retaining bolt is from the front to the rear of the engine. Torque the retaining bolts to 30–35 ft lbs.

The 302 V8 is equipped with individual stud-mounted rocker arms. Use the following procedure to remove the rocker arms:

1. On the right cylinder head, disconnect the choke heat chamber air hose.
2. Remove the air cleaner and inlet duct assembly, the choke heat tube, PCV valve and hose, and the EGR hoses (1973 and later models only).
2. Remove the Thermactor by-pass valve and air supply hoses.
3. Label and disconnect the spark plug wires at the plugs. Remove the plug wires from the harness.
4. Remove the valve cover attaching bolts and remove the covers.
5. Remove the valve rocker arm stud nut, fulcrum seat, and then the rocker arm.
6. Reverse the above procedure to install, taking care to adjust the valve lash as outlined under "Preliminary Valve Adjustment."

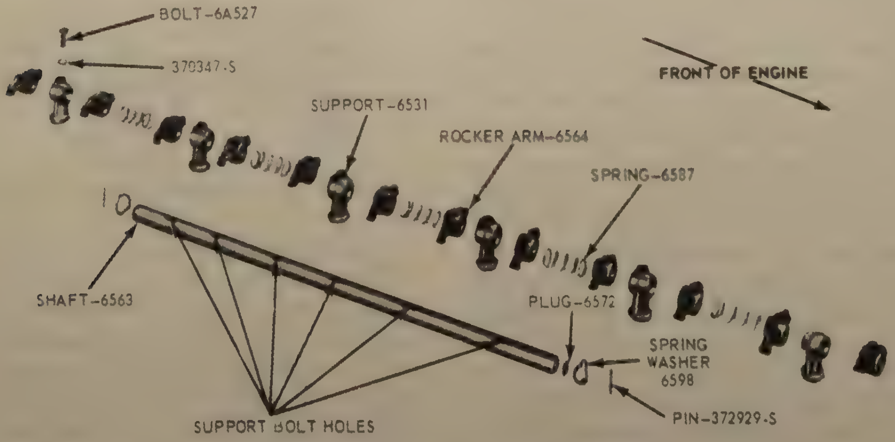


302 V8 Rocker Arm Assembly

Preliminary Valve Adjustment

All Maverick and Comet engines are equipped with hydraulic valve lifters. Valve systems with hydraulic valve lifters operate with zero clearance in the valve train and, because of this, the rocker arms are nonadjustable. The only means by which valve system clearances can be altered is by installing 0.060 in. over or undersize pushrods. Because of the hydraulic lifter's natural ability to compensate for slack in the valve train, all components of the valve system should be checked for wear if there is excessive play in the system.

When a valve in the engine is in the closed position, the valve lifter is resting

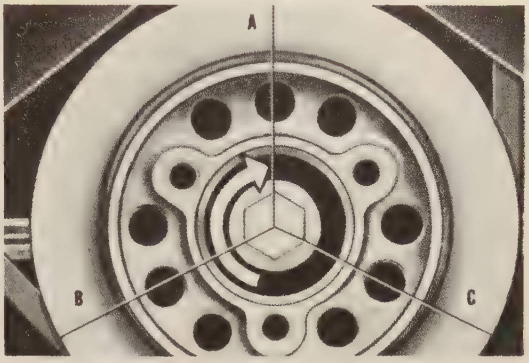


Six-Cylinder Rocker Arm Shaft Assembly

on the base circle of the camshaft lobe and the pushrod is in its lowest position. To remove this additional clearance from the valve train, the valve lifter expands to maintain zero clearance in the valve system. When a rocker arm is loosened or removed from the engine, the lifter expands to its fullest travel. When the rocker arm is reinstalled on the engine, the proper valve setting is obtained by tightening the rocker arm to a specified limit. With the lifter fully expanded, if the camshaft lobe is on a high point, it will require excessive torque to compress the lifter and obtain the proper setting. Because of this, when any component of the valve system has been removed, a preliminary valve adjustment procedure must be followed to ensure that when the rocker arm is reinstalled on the engine and tightened, the camshaft lobe for that cylinder is in the low position.

6 Cylinder

1. Crank the engine until the TDC mark on the crankshaft damper is aligned with timing pointer on the cylinder front cover.
2. Scribe a mark on the damper at this point.
3. Scribe two more marks on the damper, each equally spaced from the first mark (see illustration).
4. With the engine on TDC of the compression stroke (mark A aligned with the pointer), back off the rocker arm adjusting nut until there is end-play in the pushrod. Tighten the adjusting nut until all clearance is removed, then tighten the adjusting nut one additional turn. To determine when all clearance is removed from the rocker arm, turn the pushrod with the fingers. When the pushrod can no longer be turned, all clearance has been removed.

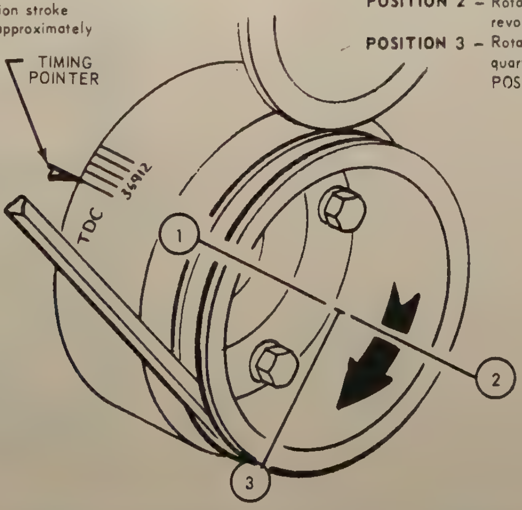


Position of Crankshaft Damper for Preliminary Valve Adjustment—Six-Cylinder Engines

5. Repeat this procedure for each valve, turning the crankshaft ⅓ turn to the next mark each time and following the engine firing order of 1-5-3-6-2-4.

302 V8

1. Crank the engine until no. 1 cylinder is at TDC of the compression stroke and the timing pointer is aligned with the mark on the crankshaft damper.
2. Scribe a mark on the damper at this point.
3. Scribe two additional marks on the damper (see illustration).



With No. 1 at TDC at end of compression stroke make a chalk mark at points 2 and 3 approximately 90 degrees apart.

POSITION 1 – No. 1 at TDC at end of compression stroke.
POSITION 2 – Rotate the crankshaft 180 degrees (one half revolution) clockwise from POSITION A.
POSITION 3 – Rotate the crankshaft 270 degrees (three quarter revolution) clockwise from POSITION 2.

Position of Crankshaft Damper for Preliminary Valve Adjustment—V8 Engine

4. With the timing pointer aligned with mark "A" on the damper, tighten the following valves to the specified torque:

No. 1, 7, and 8 Intake; No. 1, 5, and 4 Exhaust.

5. Rotate the crankshaft 180° to point "B" and tighten the following valves:

No. 5 and 4 Intake; No. 2 and 6 Exhaust.

6. Rotate the crankshaft 270° to point "C" and tighten the following valves:

No. 2, 3, and 6 Intake; No. 7, 3, and 8 Exhaust.

7. Rocker arm specifications are: tighten nut until it contacts the rocker shoulder, then torque to 18–20 ft lbs.

INTAKE MANIFOLD

Removal and Installation

170, 200, and 250 Six-Cylinder

All six-cylinder engines used in the Maverick and Comet have an intake manifold which is an integral casting with the cylinder head and, therefore, cannot be removed.

302 V8

1. Drain the cooling system.

2. Disconnect the upper radiator hose and water pump by-pass hose from the thermostat housing. Disconnect the water temperature sending unit wire. Remove the heater hose from the automatic choke housing and disconnect the hose from the intake manifold.

3. Remove the air cleaner. Disconnect the automatic choke heat chamber air inlet hose at the inlet tube near the right valve cover. Remove the crankcase ventilation hose and intake duct assembly. On 1974 California registered vehicles, disconnect the Thermactor air hose from the check valve at the rear of the intake manifold and loosen the hose clamp at the bracket. Remove the air hose and Thermactor air bypass valve from the bracket and position it to one side.

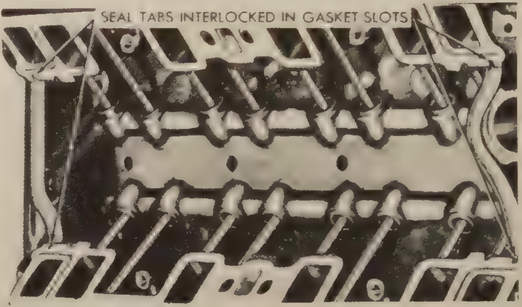
4. Remove all carburetor linkage and automatic transmission kick-down linkage that attaches to the manifold. Disconnect the fuel line, choke heat tube, and any vacuum lines from the carburetor or intake manifold, marking them for installation.

5. Disconnect the distributor vacuum hoses from the distributor. Remove the distributor cap and mark the relative position of the rotor on the distributor housing. Disconnect the spark plug wires at the spark plugs and the primary and secondary wires from the coil. Remove the distributor hold-down bolt and remove the distributor.

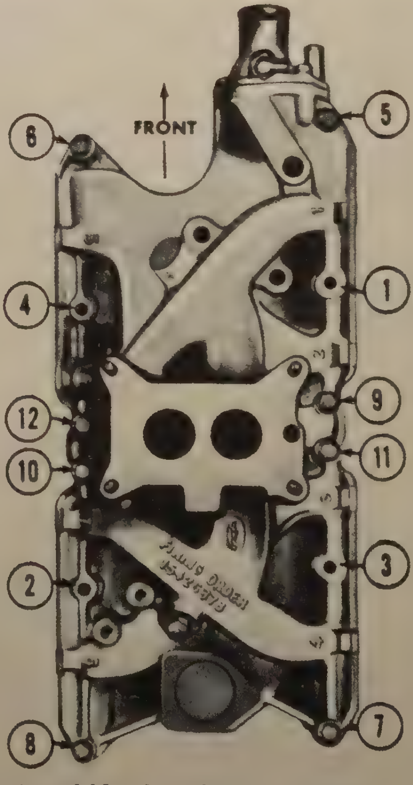
6. If equipped with air conditioning, remove the brackets retaining the compressor to the intake manifold.

7. Remove the manifold attaching bolts. Lift off the intake manifold and carburetor as an assembly.

NOTE: *If it is necessary to pry the manifold to loosen it from the engine, be careful not to damage any gasket sealing surfaces. Always discard all old gaskets and attaching bolt sealing washers.*



Intake Manifold Gaskets and Seals—302 V8



Intake Manifold Bolt Tightening Sequence

8. Clean all gasket surfaces and firmly cement new gaskets in place, using nonhardening sealer. Make sure that the gaskets interlock with the seal tabs, and that the gasket holes align with those in the cylinder heads.

9. Reverse the above procedure to install, taking care to run a finger around the seal area on the installed manifold to make sure that the seals did not slip out during installation. Finally, torque the intake manifold bolts to 23–25 ft lbs in the proper sequence, and recheck the torque after the engine is warm.

EXHAUST MANIFOLD

Removal and Installation

170, 200, AND 250 SIX-CYLINDER

1. Remove the air cleaner and heat duct body.

2. Disconnect the EGR tube from the exhaust manifold if so equipped.

3. Disconnect the muffler inlet pipe and remove the choke hot air tube from the manifold.

4. Bend the exhaust manifold attaching bolt locktabs back, and remove the bolts and the manifold.

5. Clean all manifold mating surfaces and place a new gasket on the muffler inlet pipe.

6. Reinstall the manifold by reversing the above procedure, torque the attaching bolts in sequence from the centermost bolt outward.

302 V8

1. On the right exhaust manifold, remove the air cleaner and intake duct assembly.

2. Disconnect the automatic choke heat chamber air inlet hose from the inlet tube near the right valve cover. Remove the automatic choke heat tube.

3. Remove the nuts or bolts retaining the heat stove to the exhaust manifold and remove the stove.

4. Disconnect the exhaust manifold(s) from the muffler inlet pipe(s).

5. Remove the manifold retaining bolts and washers and the manifold(s).

6. Reverse the above procedure to install, using new inlet pipe gaskets. Torque the exhaust manifold retaining bolts to 12–16 ft lbs, in sequence from the centermost bolt outward. Start the engine and check for exhaust leaks.

TIMING CHAIN AND COVER

Removal and Installation

170, 200, AND 250 SIX-CYLINDER

1. Drain the cooling system and crankcase.

2. Disconnect the upper radiator hose from the intake manifold and the lower hose from the water pump. On cars with automatic transmission, disconnect the cooler lines from the radiator.

3. Remove the radiator, fan pulley, and engine drive belts. On models with air conditioning, remove the condenser retaining bolts and position the condenser forward. Do not disconnect the refrigerant lines.

4. On 170 and 200 cu in. engines remove the cylinder front cover retaining bolts and front oil pan bolts and gently pry the cover away from the block. On 250 engines, it is necessary to remove the oil pan before removing the front cover. On 250 engines, remove the chain snubber, if in need of replacement.

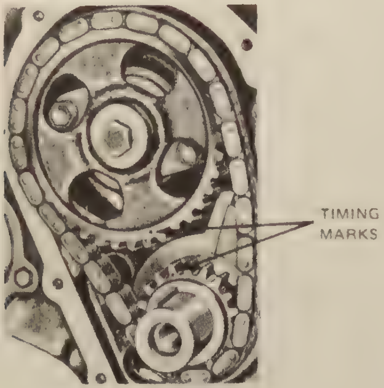
5. Remove the crankshaft pulley bolt and use a puller to remove the vibration damper.

6. With a socket wrench of the proper size on the crankshaft pulley bolt, gently rotate the crankshaft in a clockwise direction until all slack is removed from the left side of the timing chain. Scribe a mark on the engine block parallel to the present position of the left side of the chain. Turn the crankshaft in a counterclockwise direction to remove all the slack from the right side of the chain. Force the left side of the chain outward with the fingers and measure the distance between the reference point and the present position of the chain. If the distance exceeds ½ in., replace the chain and sprockets.

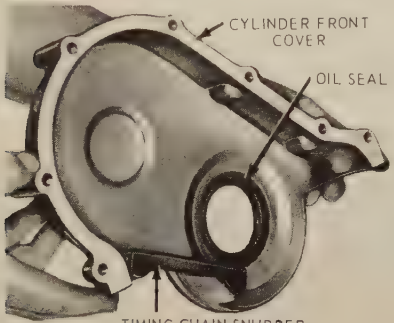
7. Crank the engine until the timing marks are aligned as shown in the illustration. Remove the bolt, slide the sprocket and chain forward, and remove as an assembly.

To install:

1. Position the sprockets and chain on the engine, making sure that the timing marks are aligned. On 250 engines, install the timing snubber, if removed.



Aligning Timing Marks



Timing Chain Snubber Installation—
250 Six-Cylinder Engine

2. Reinstall the front cover, applying oil-resistant sealer to the new gasket.

NOTE: *On 170 and 200 engines, trim away the exposed portion of the old oil pan gasket flush with the front of the engine block. Cut and position the required portion of a new gasket to the oil pan, applying sealer to both sides of it.*

3. On 250 engines, reinstall the oil pan.

4. Install the fan, pulley, and belts. Adjust belt tension.

5. Install the radiator, and connect the radiator hoses and transmission cooling lines. If equipped with air conditioning, install the condenser.

6. Fill the crankcase and cooling system. Start the engine and check for leaks.

302 V8

1. Drain the cooling system and the crankcase. Disconnect the negative battery cable.

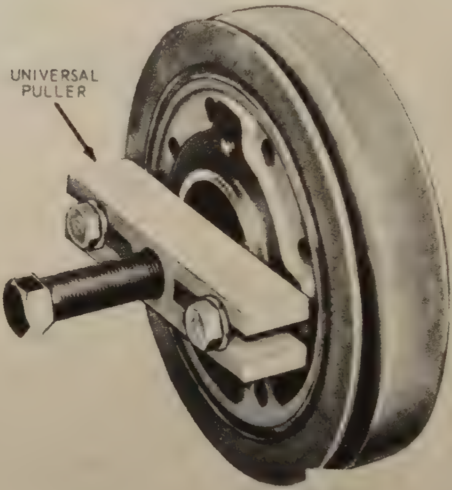
2. If your car is equipped with a fan shroud, remove the shroud retaining bolts and position the shroud to the rear. On all applications, remove the bolts attaching the spacer to the water pump and remove the fan and spacer (or fan drive clutch) from the water pump shaft. Remove the fan shroud, if so equipped.

3. On models so equipped, remove the air conditioner drive belt and idler pulley bracket. On all models, remove the alternator and alternator drive belt. On models so equipped, remove the power steering pump and drive belt. On models so equipped, remove the Thermactor air pump and drive belt.

4. Remove the water pump pulley.

5. Disconnect the radiator hose, heater hose, and the water pump by-pass hose from the water pump.

6. Remove the crankshaft pulley from the crankshaft vibration damper. After removing the damper retaining screw and washer, install a universal gear puller on the damper and pull it off.



Removing Crankshaft Vibration Damper

7. Disconnect the fuel pump outlet line at the fuel pump. Remove the fuel pump retaining bolts and position the pump to one side with the flexible fuel line still attached.

8. Remove the engine oil level dipstick.

9. Remove the bolts attaching the oil pan to the cylinder front cover. Using a thin-bladed knife, cut the oil pan gasket flush with the cylinder block face prior to separating the cover from the cylinder block. Then remove the cylinder front cover and water pump as an assembly.

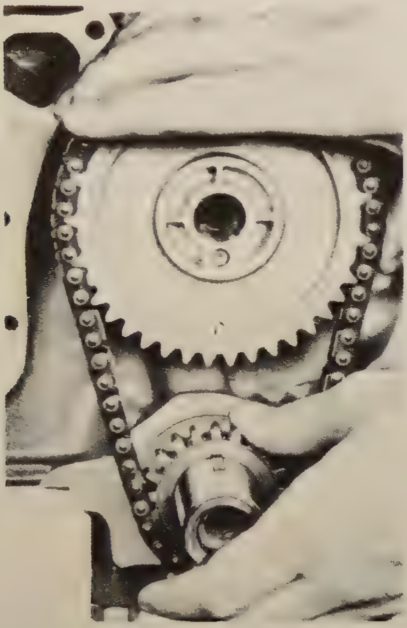
NOTE: *If the front cover is to be re-*

placed, transfer the water pump and dipstick tube from the old cover.

10. Discard the old cylinder front cover gasket, and remove the crankshaft front oil slinger.

11. Check the timing chain deflection as outlined under Step 6 of the six-cylinder "Timing Chain and Cover" removal procedure.

12. Turn the engine over in the normal direction of rotation until the timing marks (see illustration) are positioned "dot-to-dot."



Removing Timing Chain and Sprockets

13. Remove the camshaft sprocket capscrew, washers and the fuel pump eccentric. Slide both sprockets and the timing chain forward, and remove them as an assembly.

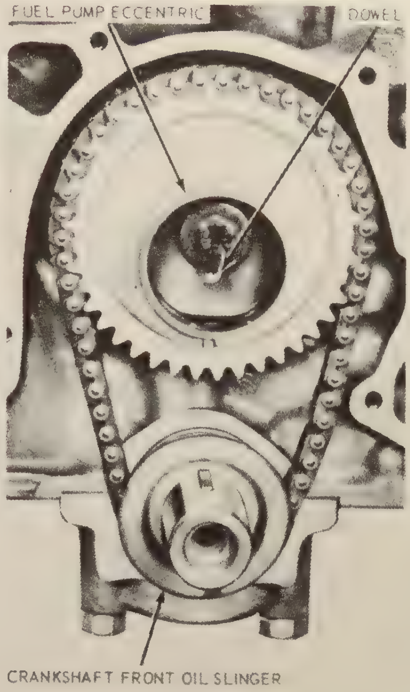
To install:

1. Position the sprockets and timing chain on the camshaft and crankshaft simultaneously, on a centerline.

2. Install the fuel pump eccentric, washers and camshaft sprocket capscrew. Tighten the capscrew to 30–35 ft lbs. Install the front oil slinger.

3. Clean the cylinder front covers, oil pan and cylinder block mating surfaces to remove all old gasket material.

4. Replace the oil seal as outlined under "Timing Gear Cover Oil Seal Replacement".



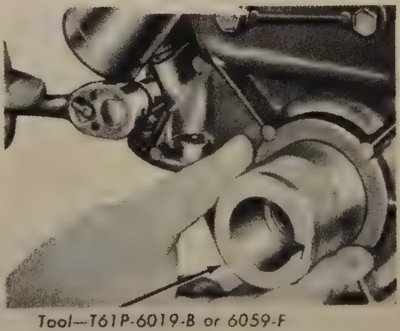
Fuel Pump Eccentric and Front Oil Slinger Installed

5. Lubricate the timing chain with engine oil.

6. Coat the gasket surface of the oil pan with oil-resistant sealer. Cut and position the required sections of a new gasket on the oil pan and apply oil-resistant sealer at the corners. Install the oil pan seal as required. Coat the gasket surfaces of the block and front cover with oil-resistant sealer, and position the new gasket on the block.

7. Place the cylinder front cover on the block, taking care to avoid seal damage or gasket mislocation.

8. Install the front cover, using a crankshaft-to-cover alignment tool. To align the holes in the block with those in the cover,



Aligning Cylinder Front Cover

it may be necessary to insert two phillips head screwdrivers in two of the bolt holes and force the cover downward, compressing the new pan gasket. Then, with the attaching bolts coated with oil for ease of installation, install the bolts, tightening them diagonally, in rotation, to a final torque of 12–15 ft lbs. Remove the alignment tool.

9. Apply white grease to the rubbing surface of the vibration damper inner hub to prevent damage to the seal. Apply a light coating of graphite and engine oil to the front of the crankshaft for damper installation. Then, align the vibration damper keyway with that of the cramshaft. Install the vibration damper on the crankshaft and install the capscrew and washer. Tighten the screw to 70–90 ft lbs. Install the crankshaft pulley.

10. Using a new gasket, install the fuel pump to the block. Connect the fuel outlet line.

11. Install the dipstick.

12. Connect the radiator hose, heater hose, and the water pump by-pass hose at the water pump.

13. On models so equipped, install the Thermactor air pump and drive belt. On models so equipped, install the power steering pump and drive belt. On all models, install the alternator and drive belt. On models so equipped, install the air conditioner idler pulley and drive belt.

14. Position the fan shroud over the water pump pulley, if so equipped. Install the fan and spacer (or fan clutch drive). Install the fan shroud retaining bolts, if so equipped.

15. Adjust all drive belts as outlined in Chapter 1.

16. Fill the crankcase and cooling system. Connect the battery cable. Bleed the cooling system.

17. Start the engine and operate it at a fast idle. Check for coolant and oil leaks.

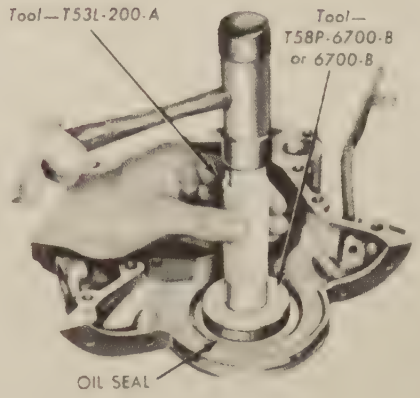
18. Adjust the ignition timing.

Timing Gear Cover Oil Seal Replacement

ALL ENGINES

It is a recommended practice to replace the cover seal any time the front cover is removed.

1. With the cover removed from the car, drive the old seal from the rear of the cover with a pin-punch. Clean out the recess in the cover.



Installing Front Cover Oil Seal

2. Coat the new seal with grease and drive it into the cover until it is fully seated. Check the seal after installation to be sure the spring is properly positioned in the seal.

CAMSHAFT

Removal and Installation

170, 200, AND 250 SIX-CYLINDER

1. Remove the cylinder head as outlined under "Cylinder Head Removal and Installation".

2. Remove the radiator.

3. Drain the crankcase. Remove the oil level dipstick and oil filter. On 250 engines, remove the oil pan, oil pump, and inlet tube as directed in "Oil Pan Removal and Installation", below.

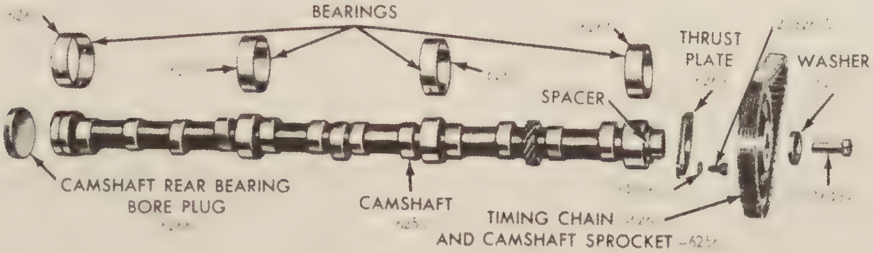
4. Remove the fuel pump and the distributor.

5. Remove the cylinder front cover, timing chain and sprockets as outlined under "Timing Chain and Cover Removal and Installation".

6. Remove the radiator grille and gravel deflector.

7. Remove the pushrods, keeping them in order. Using a magnet, withdraw the valve lifters and keep them in order so that they may be installed in their original positions. If the lifters do not come out with the magnet, use a claw-type tool to withdraw them.

8. Remove the camshaft thrust plate and remove the camshaft by carefully pulling it to the front of the engine. Use care not to damage the camshaft lobes or the


BEARINGS
THRUST PLATE
WASHER
SPACER
CAMSHAFT REAR BEARING BORE PLUG
CAMSHAFT
TIMING CHAIN AND CAMSHAFT SPROCKET

Six-Cylinder Camshaft and Related Parts

cam bearing journals while removing the cam from the engine.

9. Prior to installing the camshaft, coat the lobes with white grease, and the bearing journals and all valve parts with engine oil.

10. Reverse the above procedure to install, following the recommended torque settings and tightening sequences.

302 V8

1. Drain the cooling system. Disconnect the radiator hoses and the transmission cooler lines, if equipped with automatic transmission. If equipped with a fan shroud, remove the retaining bolts. Remove the radiator. If equipped with air conditioning, remove the bolts securing the air conditioning condenser and position the condenser to one side.

CAUTION: *Do not disconnect the refrigerant lines.*

2. Remove the intake manifold as outlined under “Intake Manifold Removal and Installation”.

3. Remove the cylinder front cover, timing chain and sprockets as outlined under “Timing Chain and Cover Removal and Installation”.

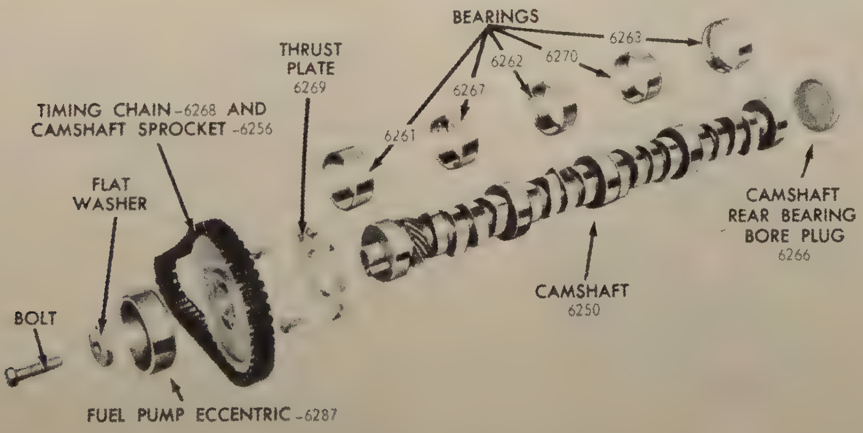
4. Remove the crankcase ventilation valve and hoses. Remove the valve covers. Loosen the valve rocker arm stud nuts and rotate the rocker arms to one side (away from the pushrods).

5. Lift out the pushrods, keeping them in order so that they may be installed in their original positions. Using a magnet, remove the valve lifters, also keeping them in order. If the lifters become stuck in their bores, use a claw-type tool to remove them.

6. Remove the camshaft thrust plate and remove the camshaft by carefully pulling it to the front of the engine. Take care not to damage the camshaft lobes or the cam bearing journals while removing the cam from the engine.

7. Prior to installing the camshaft, coat the cam lobes with white grease, and the bearing journals and all valve parts with heavy engine oil.

8. Reverse the above procedure to install, taking care to perform a preliminary valve adjustment, as outlined under “Preliminary Valve Adjustment”, before starting the engine. Exercise care to follow all


BEARINGS
6263
6262
6270
6267
6261
THRUST PLATE 6269
TIMING CHAIN -6268 AND CAMSHAFT SPROCKET -6256
FLAT WASHER
BOLT
FUEL PUMP ECCENTRIC -6287
CAMSHAFT 6250
CAMSHAFT REAR BEARING BORE PLUG 6266

V8 Camshaft and Related Parts

of the recommended torque settings and tightening sequences.

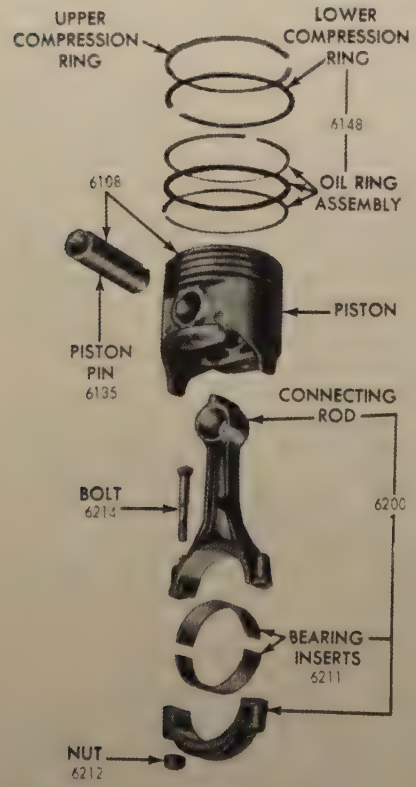
CONNECTING RODS AND PISTONS

Removal

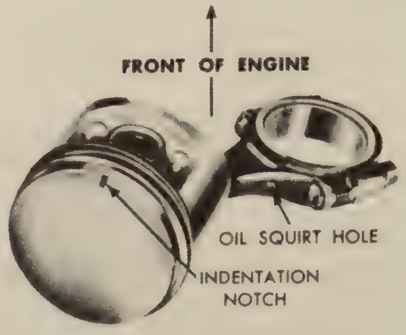
1. Drain crankcase and remove oil pan. Remove oil baffle tray if so equipped.
2. Drain cooling system and remove cylinder head or heads.
3. Remove any ridge and/or deposits from the upper end of cylinder bores with a ridge reamer.
4. Check rods and pistons for identification numbers and, if necessary, number them.
5. Remove connecting rod cap nuts and caps. Push the rods away from the crankshaft and install caps and nuts loosely to their respective rods.
6. Push pistons and rod assemblies up and out of the cylinders.

Installation

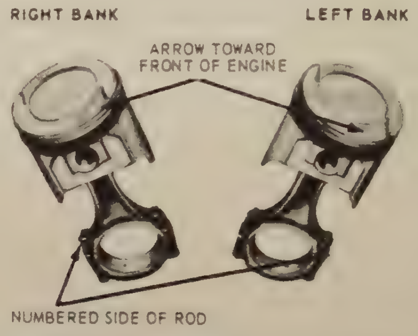
1. Lightly coat pistons, rings and cylinder walls with light engine oil.
2. With bearing caps removed, install pieces of protective rubber hose on bearing cap bolts.
3. Install each piston in its respective bore, using thread guards on each assembly. Guide the rod bearing into place on the crankcase journal.
4. Remove thread guards from connecting rods and install lower half of bearing and cap. Check clearances.
5. Install oil pan.
6. Install cylinder head.
7. Refill crankcase and cooling system.
8. Start engine, bring to operating temperature and check for leaks.


UPPER COMPRESSION RING
LOWER COMPRESSION RING
6148
6108
OIL RING ASSEMBLY
PISTON
PISTON PIN 6135
CONNECTING ROD
BOLT 6214
6200
BEARING INSERTS 6211
NUT 6212

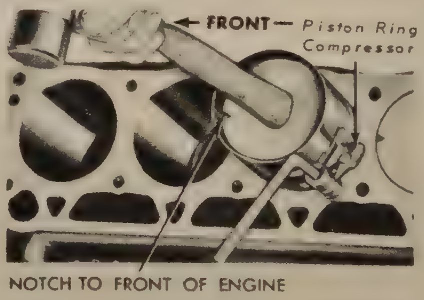
Piston, Connecting Rod and Related Parts


FRONT OF ENGINE
OIL SQUIRT HOLE
INDENTATION NOTCH

Correct Piston and Connecting Rod Positioning—Six-Cylinder Engines


RIGHT BANK
LEFT BANK
ARROW TOWARD FRONT OF ENGINE
NUMBERED SIDE OF ROD

Correct Piston and Connecting Rod Positioning—V8 Engine

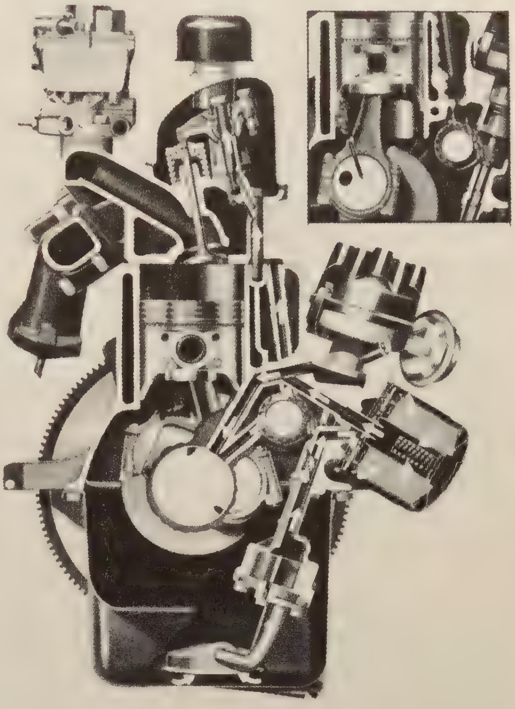

FRONT
Piston Ring Compressor
NOTCH TO FRONT OF ENGINE

Piston Installation

Piston Ring Replacement

Before replacing rings, inspect cylinder bores.

1. If cylinder bore is in satisfactory condition, place each ring in bore in turn and square it in bore with head of piston. Measure ring gap. If ring gap is greater than limit, get new ring. If ring gap is less than limit, file end of ring to obtain correct gap.
2. Check ring side clearance by installing rings on piston, and inserting feeler gauge to correct dimension between ring and lower land. Gauge should slide freely around ring circumference without binding. Any wear will form a step on lower land. Replace any pistons having high steps. Before checking ring side clearance be sure ring grooves are clean and free of carbon, sludge, or grit.
3. Space ring gaps at equidistant intervals around piston circumference. Be sure to install piston in its original bore. Install short lengths of rubber tubing over connecting rod bolts to prevent damage to rod journal. Install ring compressor over rings on piston. Lower piston rod assembly into bore until ring compressor contacts block. Using wooden handle of hammer, push piston into bore while guiding rod onto journal.



Engine Lubrication—Six-Cylinder Engines

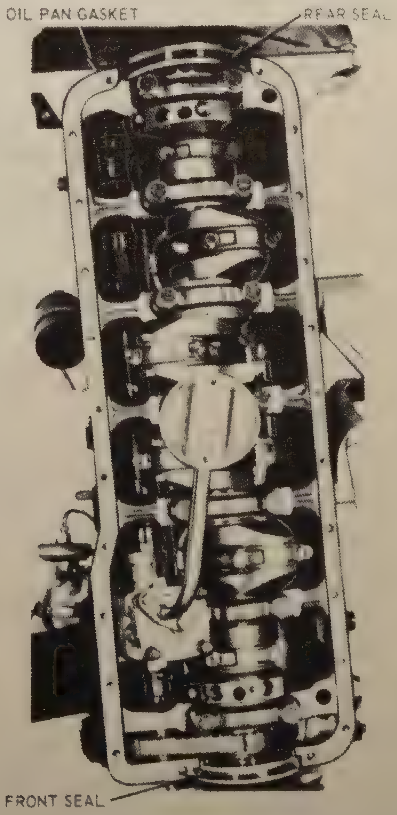
Engine Lubrication

OIL PAN

Removal and Installation

170, 200, and 250 Six-Cylinder

1. Drain the crankcase.
2. Remove the oil level dipstick and the flywheel or converter housing inspection cover.
3. Loosen the 24 bolts retaining the pan to the crankcase. Lower the pan to provide access to the oil pump.
4. Remove the two bolts retaining the oil pump inlet and screen to the oil pump. Remove the inlet tube and screen assembly. Remove the oil pan and discard the old gasket.
5. Clean the gasket surfaces of the block and oil pan, and the seal retainer grooves in the block and oil pan. Coat the block surface with oil-resistant sealer and posi-



Oil Pan Gaskets and Seals—Six-Cylinder Engines tion the two-piece oil pan gasket on the block. Clean the oil pump inlet tube and screen.

6. Position the oil pan front seal on the cylinder front cover and the rear seal on the rear main bearing cap. Be sure that the tabs on the seals are over the oil pan gasket.

7. Using a new gasket, install the inlet tube and screen assembly. Tighten the attaching bolts to 10–15 ft lbs. Hold the oil pan in place and install a bolt, finger-tight, on each side of the pan. Then, install the remaining bolts. Tighten them, from the center outward to a torque of 7–9 ft lbs.

8. Install the dipstick and inspection cover. Fill the crankcase to the proper level. Start the engine and check for leaks.

302 V8

1. Raise the car and install jack stands under the lower control arms. Drain the crankcase.

2. Remove the front stabilizer bar from the chassis.

3. Remove the engine front support through-bolts and remove the supports. If equipped with power steering, remove the bolt and nut attaching the power steering lines to the back side of the lower control arm.

4. Remove the idler arm bracket attaching bolts and pull the linkage down and out of the way.

5. Remove the 22 oil pan attaching bolts and remove the pan. Discard the old gasket.

6. Remove the oil pump inlet tube and screen assembly.

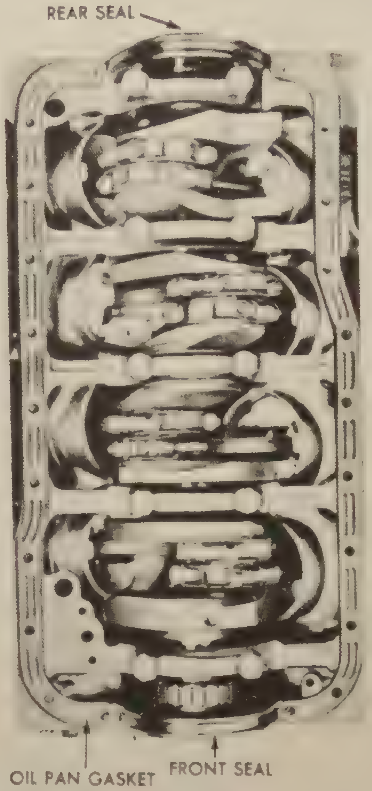
7. Clean the oil pan and inspect for damage. Clean the oil pump inlet tube and screen assembly.

8. Clean the mating surfaces of the block and oil pan. Position the inlet tube and screen assembly with a new gasket to the pump and tighten the two attaching bolts to 10–15 ft lbs.

9. Coat the block surface with oil-resistant sealer. Position the two-piece gasket to the block.

10. Position the oil pan front seal on the cylinder front cover and the rear seal on the rear main bearing cap. Make sure that the tabs on the seal are over the pan gasket.

11. Position the oil pan to the cylinder block. Install the attaching bolts and tighten them, from the center out, to 7–9 ft lbs.



Oil Pan Gaskets and Seals—V8 Engine

12. Install the idler arm bracket and the power steering line bracket.

13. Position the engine supports to the chassis side rails and install the attaching bolts. Torque to 20–37 ft lbs.

14. Install the stabilizer bar.

15. Remove the jack stands and lower the vehicle. Fill the crankcase to the proper level. Start the engine and check for leaks.

REAR MAIN OIL SEAL

Replacement

1. Remove the oil pan and, if required, the oil pump.

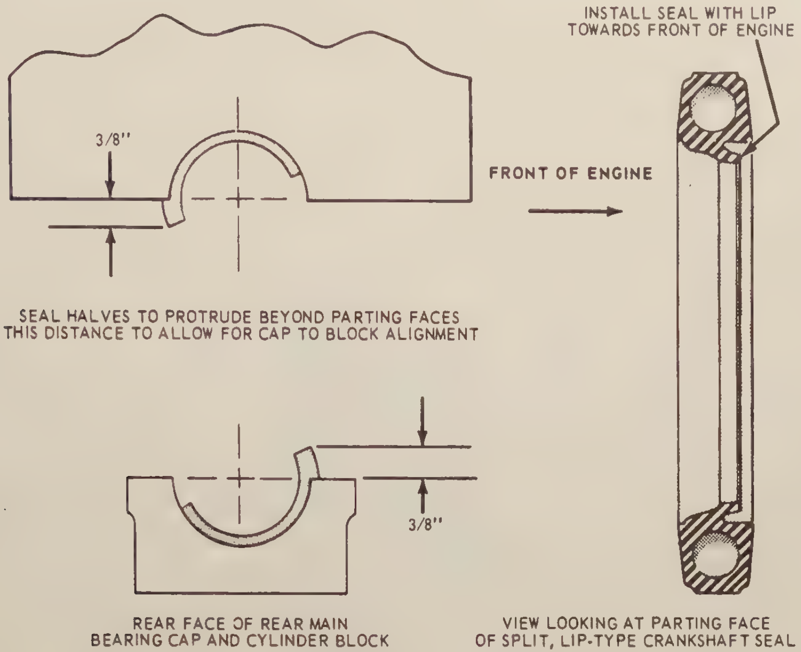
2. Loosen all main bearing caps, allowing the crankshaft to lower slightly.

NOTE: *The crankshaft should not be allowed to drop more than $1/32$ in.*

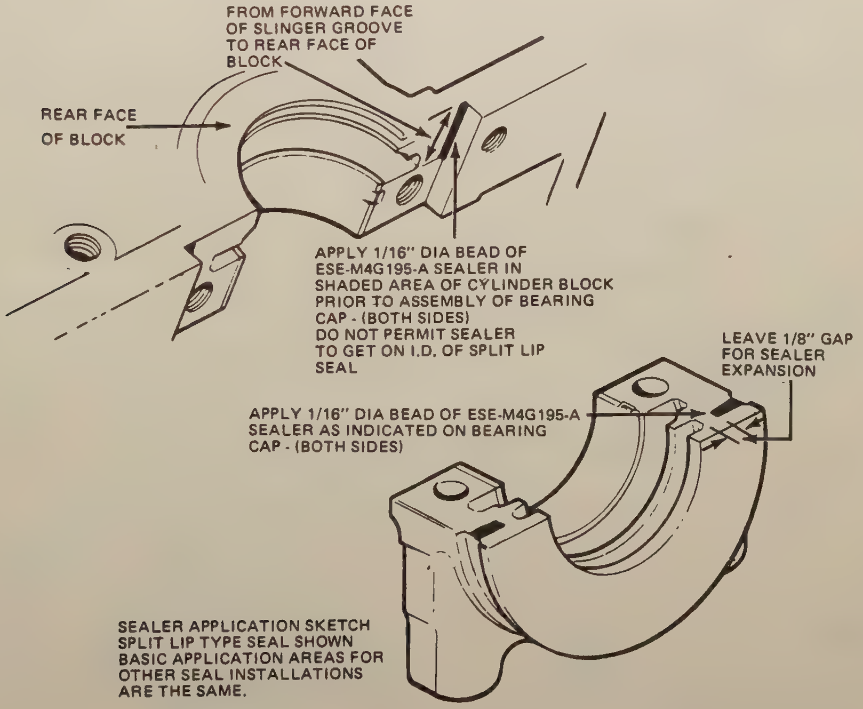
3. Remove the rear main bearing cap and the seal from the cap and block.

4. Carefully clean the seal grooves in the cap and block with solvent.

5. Soak the new seal halves in clean engine oil.


INSTALL SEAL WITH LIP TOWARDS FRONT OF ENGINE
3/8"
FRONT OF ENGINE
SEAL HALVES TO PROTRUDE BEYOND PARTING FACES THIS DISTANCE TO ALLOW FOR CAP TO BLOCK ALIGNMENT
3/8"
REAR FACE OF REAR MAIN BEARING CAP AND CYLINDER BLOCK
VIEW LOOKING AT PARTING FACE OF SPLIT, LIP-TYPE CRANKSHAFT SEAL

Installing Rear Main Oil Seal


FROM FORWARD FACE OF SLINGER GROOVE TO REAR FACE OF BLOCK
REAR FACE OF BLOCK
APPLY 1/16" DIA BEAD OF ESE-M4G195-A SEALER IN SHADED AREA OF CYLINDER BLOCK PRIOR TO ASSEMBLY OF BEARING CAP - (BOTH SIDES) DO NOT PERMIT SEALER TO GET ON I.D. OF SPLIT LIP SEAL
LEAVE 1/8" GAP FOR SEALER EXPANSION
APPLY 1/16" DIA BEAD OF ESE-M4G195-A SEALER AS INDICATED ON BEARING CAP - (BOTH SIDES)
SEALER APPLICATION SKETCH SPLIT LIP TYPE SEAL SHOWN BASIC APPLICATION AREAS FOR OTHER SEAL INSTALLATIONS ARE THE SAME.

Applying RTV Sealer to Main Bearing Cap and Block

6. Install the upper half of the seal in the block with the undercut side of the seal toward the front of the engine. Slide the seal around the crankshaft journal until ⅜ in. protrudes beyond the base of the block.

7. Repeat the above procedure on the lower seal, allowing an equal length of the seal to protrude beyond the opposite end of the bearing cap.

8. Install the rear bearing cap and torque all main bearings to specifications.

Apply sealer only to the rear of the seals.

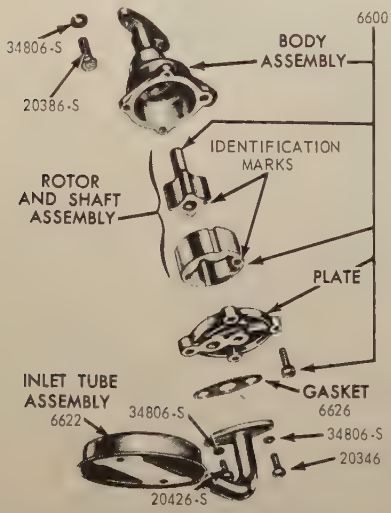
9. Dip the bearing cap side seals in oil, then immediately install them. Do not use any sealer on the side seals. Tap the seals into place and do not clip the protruding ends.

10. Install the oil pump and pan. Fill the crankcase with oil, start the engine, and check for leaks.

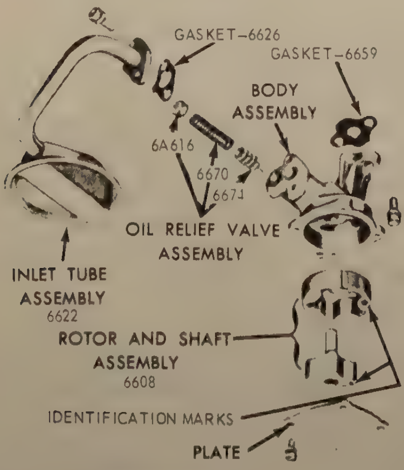
OIL PUMP

Removal and Installation

1. Remove the oil pan as outlined under the applicable "Oil Pan Removal and Installation" section, above.
2. Remove the oil pump inlet tube and screen assembly.
3. Remove the oil pump attaching bolts. Lower the oil pump, gasket, and intermediate driveshaft from the crankcase.


6600
34806-S
20386-S
BODY ASSEMBLY
IDENTIFICATION MARKS
ROTOR AND SHAFT ASSEMBLY
PLATE
INLET TUBE ASSEMBLY 6622
34806-S
GASKET 6626
34806-S
20346
20426-S

Six-Cylinder Oil Pump Disassembled


GASKET–6626
GASKET–6659
BODY ASSEMBLY
6A616
6670
6671
OIL RELIEF VALVE ASSEMBLY
INLET TUBE ASSEMBLY 6622
ROTOR AND SHAFT ASSEMBLY 6608
IDENTIFICATION MARKS
PLATE

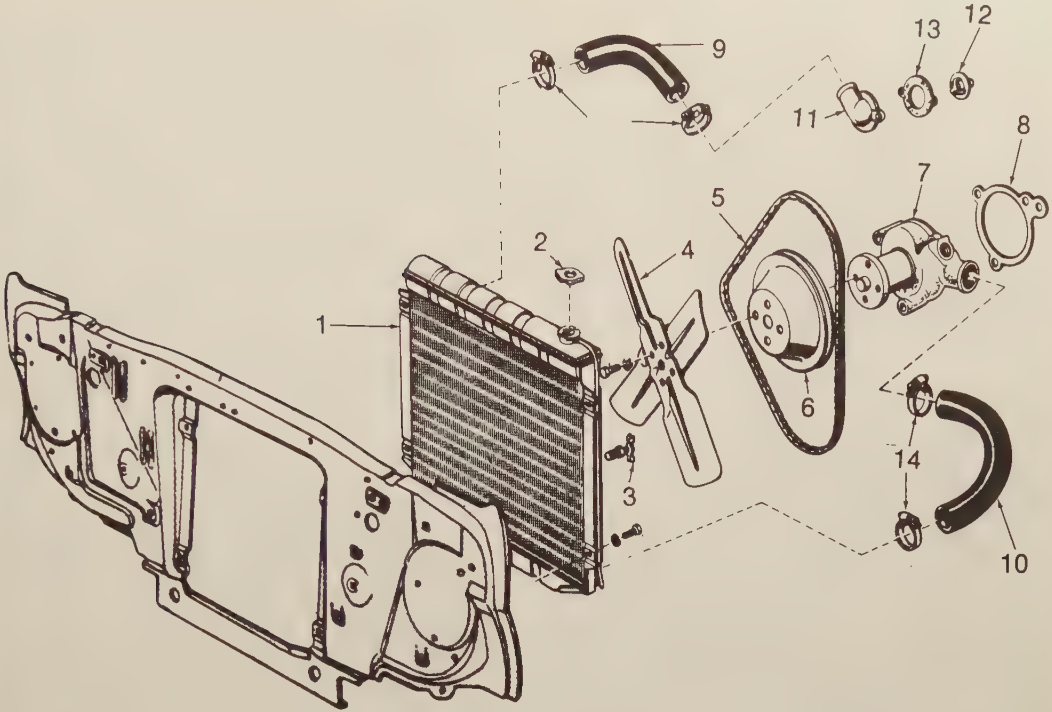
V8 Oil Pump Disassembled

4. To install, prime the oil pump by filling either the inlet or outlet port with engine oil. Rotate the pump shaft to distribute the oil within the pump body.
5. Position the intermediate driveshaft into the distributor socket. With the shaft firmly seated in the socket, the stop on the shaft should contact the roof of the crankcase. Remove the shaft and position the stop as necessary.
6. Insert the intermediate driveshaft into the oil pump. Using a new gasket, install the pump and shaft as an assembly. Do not attempt to force the pump into position if it will not seat readily. If necessary, rotate the intermediate driveshaft hex into a new position so that it will mesh with the distributor shaft.
7. Torque the oil pump attaching bolts to 10–15 ft lbs on the six-cylinder engines, and 22–32 ft lbs on the 302 V8.
8. Clean and install the inlet tube and screen assembly.
9. Install the oil pan as outlined under "Oil Pan Removal and Installation."

Engine Cooling

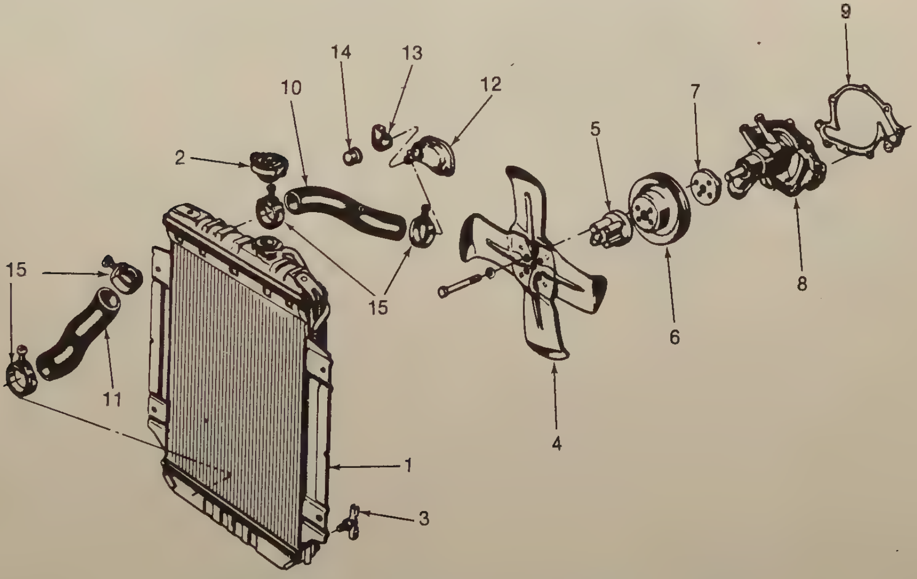
All Maverick and Comet engines are water-cooled by a solution of water and anti-freeze which passes from the radiator, through the lower radiator hose, past the water pump, through the cooling passages of the engine, past the thermostat, through the upper radiator hose and back into the radiator. As the hot coolant passes through the radiator, outside air is drawn through the radiator cooling fins by the engine fan and heat is exchanged, prior to the coolant's recirculation through the engine. Heat is supplied to car's interior by by-passing a portion of the coolant through the heater core.

When the engine is cold, the thermostat, which is located in a housing between the top of the engine and the upper radiator hose, is closed and prevents the coolant from passing to the radiator. This causes the coolant in the engine to heat quickly, shortening the time needed for the engine to reach its normal operating temperature.



Cooling System and Related Parts—170, 200 and 250 Six-Cylinder Engines

1. Radiator
2. Radiator cap
3. Radiator petcock
4. Radiator fan
5. Fan belt
6. Pulley
7. Water pump
8. Water pump gasket
9. Upper radiator hose
10. Lower radiator hose
11. Thermostat housing
12. Thermostat
13. Thermostat gasket
14. Hose clamps



Cooling System and Related Parts—302 V8 Engine

1. Radiator
2. Radiator cap
3. Radiator petcock
4. Radiator fan
5. Fan spacer
6. Pulley
7. Pulley hub
8. Water pump
9. Water pump gasket
10. Upper radiator hose
11. Lower radiator hose
12. Coolant outlet
13. Thermostat housing
14. Thermostat
15. Hose clamps

When the coolant reaches a predetermined temperature, the thermostat opens and the normal cooling cycle begins.

If your car is equipped with an automatic transmission, the bottom section of the radiator contains an automatic transmission oil cooler. Oil from the transmission is transported by a pair of metal hydraulic lines to and from the radiator's lower section, where it is cooled.

RADIATOR

Removal and Installation

1. Drain the cooling system.
2. Disconnect the upper and lower hoses at the radiator.
3. On cars with automatic transmissions, disconnect the oil cooler lines at the radiator.
4. On vehicles with a fan shroud, remove the shroud retaining screws and position the shroud out of the way.
5. Remove the radiator attaching bolts and lift out the radiator.
6. If a new radiator is to be installed, transfer the petcock from the old radiator to the new one. On cars with automatic transmissions, transfer the oil cooler line fittings from the old radiator to the new one.
7. Position the radiator and install, but do not tighten, the radiator support bolts. On cars with automatic transmissions, connect the oil cooler lines. Then tighten the radiator support bolts.
8. On vehicles with a fan shroud, reinstall the shroud.
9. Connect the radiator hoses. Close the radiator petcock. Then fill and bleed the cooling system.
10. Start the engine and bring to operating temperature. Check for leaks.
11. On cars with automatic transmissions, check the cooler lines for leaks and interference. Check the transmission fluid level.

WATER PUMP

Removal and Installation

170, 200, AND 250 SIX-CYLINDER

1. Drain the cooling system.
2. Remove the alternator, power steering, air conditioning, and Thermactor drive belts (if so equipped).
3. Disconnect the lower radiator hose at the water pump. Remove the fan and water pump pulley.
4. Disconnect the heater hose at the water pump.
5. Remove the water pump from the cylinder block.
6. If a new water pump is being installed, transfer the old heater hose fitting to the new pump. Clean the mating gasket surfaces on the water pump and cylinder block. On a 250 engine, trim away the old combination water pump-timing chain front cover gasket at the edge of the front cover, and use a water pump service gasket to replace it.
7. Coat both sides of the new gasket with water-resistant sealer and install it on the block. Position the water pump and install the lockwashers an attaching bolts (the alternator adjusting arm is retained by one of the water pump bolts). Torque the bolts to 12–15 ft lbs diagonally, in rotation.
8. Connect the lower radiator hose and the heater hose. Install the water pump pulley and fan.
9. Install the accessory drive belts and adjust the belt tension as outlined in Chapter 1.
10. Fill and bleed the cooling system. Operate the engine until normal running temperature is reached. Check for leaks and check the coolant level.

302 V8

1. Drain the cooling system.
2. If equipped with a fan shroud, remove the shroud attaching bolts and position the shroud over the fan.
3. Remove the fan and spacer from the water pump shaft. Remove the shroud, if so equipped.
4. Remove the air conditioning drive belt and idler pulley, if so equipped. Remove the alternator, power steering, and Thermactor drive belts, if so equipped. Remove the power steering pump attaching bolts, if so equipped, and position it to one side (leaving it connected).
5. Remove all accessory brackets which attach to the water pump. Remove the water pump pulley.
6. Disconnect the lower radiator hose, heater hose, and the water pump by-pass hose at the water pump.
7. Remove the bolts attaching the water

pump to the front cover. Remove the pump and gasket. Discard the old gasket.

8. Remove all old gasket material from the mating surfaces of the front cover and water pump.
9. Coat both sides of a new gasket with water-resistant sealer and place it on the front cover. Install the water pump and tighten the attaching bolts diagonally, in rotation, to 12–15 ft lbs.
10. Connect the lower radiator hose, heater hose, and water pump by-pass hose at the water pump.
11. Install all accessory brackets attaching to the water pump. Install the pump pulley on the pump shaft.
12. Install the power steering pump and drive belt, if so equipped. Install the alternator, air conditioning, and Thermactor drive belts, if so equipped. Install the air conditioning idler pulley bracket, if so equipped. Adjust the drive belt tension of all accessory drive belts as outlined in Chapter 1.
13. Position the fan shroud, if so equipped, over the water pump pulley. Install the spacer and fan. Install the shroud attaching bolts, if so equipped.
14. Fill and bleed the cooling system. Operate the engine until normal running temperature is reached. Check for leaks and check the coolant level.

THERMOSTAT

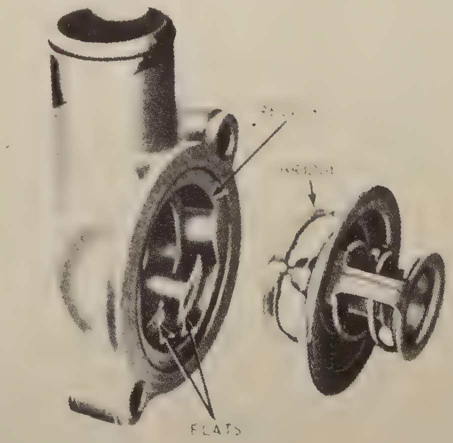
Removal and Installation

Drain the radiator until the level of coolant is below the thermostat. Remove the retaining bolts of the outlet housing and pull the housing away sufficiently to provide access to the thermostat. Remove the thermostat and gasket.

After removal, the thermostat should be checked to determine if it operates according to the following specifications:

Thermostat	*Opens*	*Fully Open*
Low Temp.	157–164°F.	184°F.
High Temp.	188–195°F.	212°F.

Clean the outlet housing and cylinder head or manifold housing gasket surfaces and coat a new gasket with water-resistant sealer. Position the gasket on the cylinder head or manifold *before* the thermostat is installed. To be sure of correct installation of the thermostat, the water outlet casting has a recess into which the thermostat is turned and locked (see accompanying illustration). Install the thermostat so that the bridge section is in the outlet casting, then turn the thermostat clockwise to lock it into position on the flats which are cast into the elbow. With the outlet elbow positioned against the cylinder head on manifold, insert the retaining bolts and tighten to 12–15 ft lbs. Fill the cooling system and check for leaks and proper coolant level after the engine has reached normal operating temperature.



Installing Thermostat

Engine Rebuilding

This section describes, in detail, the procedures involved in rebuilding a typical engine. The procedures specifically refer to an inline engine, however, they are basically identical to those used in rebuilding engines of nearly all design and configurations. Procedures for servicing atypical engines (i.e., horizontally opposed) are described in the appropriate section, although in most cases, cylinder head reconditioning procedures described in this chapter will apply.

The section is divided into two sections. The first, Cylinder Head Reconditioning, assumes that the cylinder head is removed from the engine, all manifolds are removed, and the cylinder head is on a workbench. The camshaft should be removed from overhead cam cylinder heads. The second section, Cylinder Block Reconditioning, covers the block, pistons, connecting rods and crankshaft. It is assumed that the engine is mounted on a work stand, and the cylinder head and all accessories are removed.

Procedures are identified as follows:

Unmarked—Basic procedures that must be performed in order to successfully complete the rebuilding process.

Starred (*)—Procedures that should be performed to ensure maximum performance and engine life.

Double starred (**)—Procedures that may be performed to increase engine performance and reliability. These procedures are usually reserved for extremely heavy-duty or competition usage.

In many cases, a choice of methods is also provided. Methods are identified in the same manner as procedures. The choice of method for a procedure is at the discretion of the user.

The tools required for the basic rebuilding procedure should, with minor exceptions, be those

TORQUE (ft. lbs.)*

U.S.

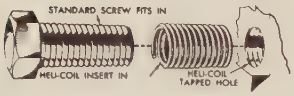
Bolt Diameter (inches)	*Bolt Grade (SAE)*				*Wrench Size (inches)*	
	⬡ *1 and 2*	⬡ *5*	⬡ *6*	⬡ *8*	*Bolt*	*Nut*
1/4	5	7	10	10.5	3/8	7/16
5/16	9	14	19	22	1/2	9/16
3/8	15	25	34	37	9/16	5/8
7/16	24	40	55	60	5/8	3/4
1/2	37	60	85	92	3/4	13/16
9/16	53	88	120	132	7/8	7/8
5/8	74	120	167	180	15/16	1
3/4	120	200	280	296	1-1/8	1-1/8
7/8	190	302	440	473	1-5/16	1-5/16
1	282	466	660	714	1-1/2	1-1/2

Metric

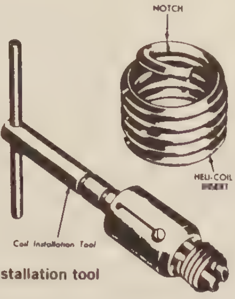
Bolt Diameter (mm)	*Bolt Grade*				Wrench Size (mm) Bolt and Nut
	5D *5D*	8G *8G*	10K *10K*	12K *12K*	
6	5	6	8	10	10
8	10	16	22	27	14
10	19	31	40	49	17
12	34	54	70	86	19
14	55	89	117	137	22
16	83	132	175	208	24
18	111	182	236	283	27
22	182	284	394	464	32
24	261	419	570	689	36

*—Torque values are for lightly oiled bolts. CAUTION: Bolts threaded into aluminum require much less torque.

General Torque Specifications



Heli-Coil installation
(© Chrysler Corp.)



Heli-Coil and installation tool

Heli-Coil Insert			*Drill*	*Tap*	*Insert. Tool*	*Extracting Tool*
Thread Size	*Part No.*	*Insert Length (In.)*	*Size*	*Part No.*	*Part No.*	*Part No.*
1/2 -20	1185-4	3/8	17/64(.266)	4 CPB	528-4N	1227-6
5/16-18	1185-5	15/32	Q(.332)	5 CPB	528-5N	1227-6
3/8 -16	1185-6	9/16	X(.397)	6 CPB	528-6N	1227-6
7/16-14	1185-7	21/32	29/64(.453)	7 CPB	528-7N	1227-16
1/2 -13	1185-8	3/4	33/64(.516)	8 CPB	528-8N	1227-16

Heli-Coil Specifications

included in a mechanic's tool kit. An accurate torque wrench, and a dial indicator (reading in thousandths) mounted on a universal base should be available. Bolts and nuts with no torque specification should be tightened according to size (see chart). Special tools, where required, all are readily available from the major tool suppliers (i.e., Craftsman, Snap-On, K-D). The services of a competent automotive machine shop must also be readily available.

When assembling the engine, any parts that will be in frictional contact must be pre-lubricated, to provide protection on initial start-up. Vortex Pre-Lube, STP, or any product specifically formulated for this purpose may be used. NOTE: *Do not use engine oil.* Where semi-permanent (locked but removable) installation of bolts or nuts is desired, threads should be cleaned and coated with Loctite. Studs may be permanently installed using Loctite Stud and Bearing Mount.

Aluminum has become increasingly popular for use in engines, due to its low weight and excellent heat transfer characteristics. The following precautions must be observed when handling aluminum engine parts:

—Never hot-tank aluminum parts.

—Remove all aluminum parts (identification tags, etc.) from engine parts before hot-tanking (otherwise they will be removed during the process).

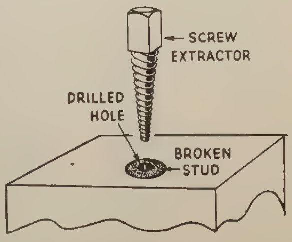
—Always coat threads lightly with engine oil or anti-seize compounds before installation, to prevent seizure.

—Never over-torque bolts or spark plugs in aluminum threads. Should stripping occur, threads can be restored according to the following procedure, using Heli-Coil thread inserts:

Tap drill the hole with the stripped threads to the specified size (see chart). Using the specified tap (NOTE: *Heli-Coil tap sizes refer to the size thread being replaced, rather than the actual tap size*), tap the hole for the Heli-Coil. Place the insert on the proper installation tool (see chart). Apply pressure on the insert while winding it clockwise into the hole, until the top of the insert is one turn below the surface. Remove the installation tool, and break the installation tang from the bottom of the insert by moving it up and down. If the Heli-Coil must be removed, tap the removal tool firmly into the hole, so that it engages the top thread, and turn the tool counter-clockwise to extract the insert.

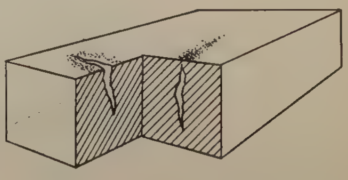
Snapped bolts or studs may be removed, using a stud extractor (unthreaded) or Vise-Grip pliers (threaded). Penetrating oil (e.g., Liquid Wrench) will often aid in breaking frozen threads. In cases where the stud or bolt is flush with, or below the surface, proceed as follows:

Drill a hole in the broken stud or bolt, approximately ½ its diameter. Select a screw extractor (e.g., Easy-Out) of the proper size, and tap it into the stud or bolt. Turn the extractor counterclockwise to remove the stud or bolt.



Screw extractor

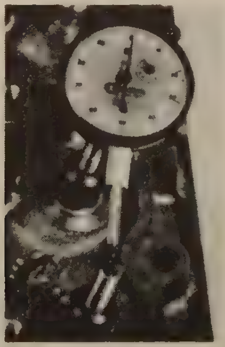
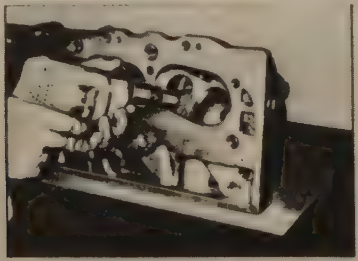
Magnaflux and Zyglo are inspection techniques used to locate material flaws, such as stress cracks. Magnafluxing coats the part with fine magnetic particles, and subjects the part to a magnetic field. Cracks cause breaks in the magnetic field, which are outlined by the particles. Since Magnaflux is a magnetic process, it is applicable only to ferrous materials. The Zyglo process coats the material with a fluorescent dye penetrant, and then subjects it to blacklight inspection, under which cracks glow bright-

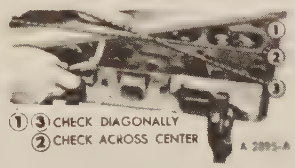
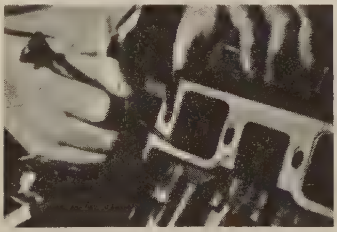
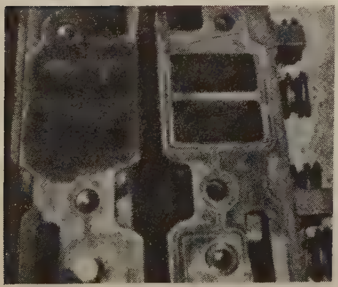


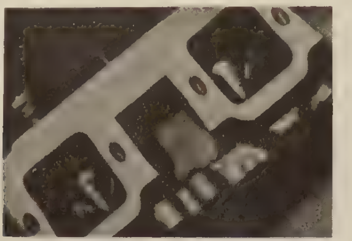
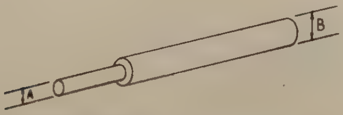
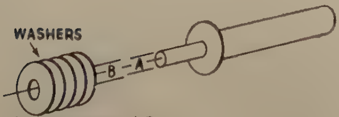
Magnaflux indication of cracks

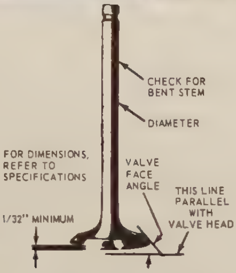
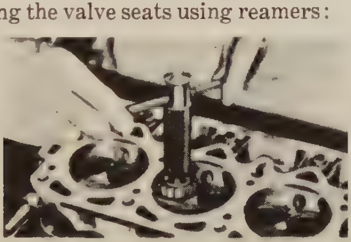
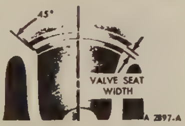
ly. Parts made of any material may be tested using Zyglo. While Magnaflux and Zyglo are excellent for general inspection, and locating hidden defects, specific checks of suspected cracks may be made at lower cost and more readily using spot check dye. The dye is sprayed onto the suspected area, wiped off, and the area is then sprayed with a developer. Cracks then will show up brightly. Spot check dyes will only indicate surface cracks; therefore, structural cracks below the surface may escape detection. When questionable, the part should be tested using Magnaflux or Zyglo.

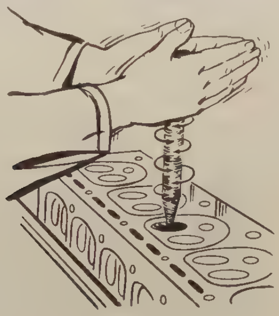
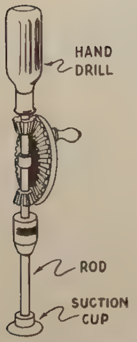
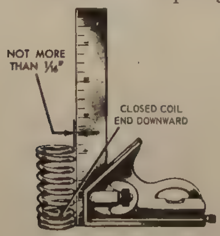
CYLINDER HEAD RECONDITIONING

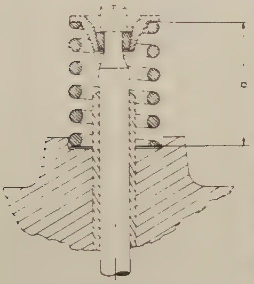
Procedure	*Method*
Identify the valves: **Valve identification** (© SAAB)	Invert the cylinder head, and number the valve faces front to rear, using a permanent felt-tip marker.
Remove the rocker arms:	Remove the rocker arms with shaft(s) or balls and nuts. Wire the sets of rockers, balls and nuts together, and identify according to the corresponding valve.
Remove the valves and springs:	Using an appropriate valve spring compressor (depending on the configuration of the cylinder head), compress the valve springs. Lift out the keepers with needlenose pliers, release the compressor, and remove the valve, spring, and spring retainer.
Check the valve stem-to-guide clearance:  **Checking the valve stem-to-guide clearance** (© American Motors Corp.)	Clean the valve stem with lacquer thinner or a similar solvent to remove all gum and varnish. Clean the valve guides using solvent and an expanding wire-type valve guide cleaner. Mount a dial indicator so that the stem is at 90° to the valve stem, as close to the valve guide as possible. Move the valve off its seat, and measure the valve guide-to-stem clearance by moving the stem back and forth to actuate the dial indicator. Measure the valve stems using a micrometer, and compare to specifications, to determine whether stem or guide wear is responsible for excessive clearance.
De-carbon the cylinder head and valves:  **Removing carbon from the cylinder head** (© Chevrolet Div. G.M. Corp.)	Chip carbon away from the valve heads, combustion chambers, and ports, using a chisel made of hardwood. Remove the remaining deposits with a stiff wire brush. NOTE: *Ensure that the deposits are actually removed, rather than burnished.*

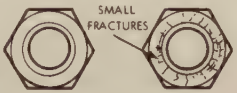
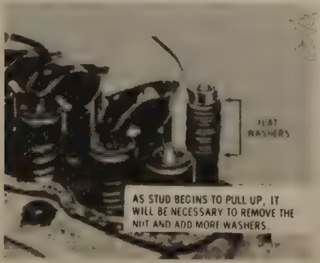
Procedure	*Method*
Hot-tank the cylinder head:	Have the cylinder head hot-tanked to remove grease, corrosion, and scale from the water passages. NOTE: *In the case of overhead cam cylinder heads, consult the operator to determine whether the camshaft bearings will be damaged by the caustic solution.*
Degrease the remaining cylinder head parts:	Using solvent (i.e., Gunk), clean the rockers, rocker shaft(s) (where applicable), rocker balls and nuts, springs, spring retainers, and keepers. Do not remove the protective coating from the springs.
Check the cylinder head for warpage:  ① ② ③ ①③ CHECK DIAGONALLY ② CHECK ACROSS CENTER A 2893-A **Checking the cylinder head for warpage** **(© Ford Motor Co.)**	Place a straight-edge across the gasket surface of the cylinder head. Using feeler gauges, determine the clearance at the center of the straight-edge. Measure across both diagonals, along the longitudinal centerline, and across the cylinder head at several points. If warpage exceeds .003″ in a 6″ span, or .006″ over the total length, the cylinder head must be resurfaced. NOTE: *If warpage exceeds the manufacturers maximum tolerance for material removal, the cylinder head must be replaced.* When milling the cylinder heads of V-type engines, the intake manifold mounting position is altered, and must be corrected by milling the manifold flange a proportionate amount.
** Porting and gasket matching:  **Marking the cylinder head for gasket matching** **(© Petersen Publishing Co.)**  **Port configuration before and after gasket matching** **(© Petersen Publishing Co.)**	** Coat the manifold flanges of the cylinder head with Prussian blue dye. Glue intake and exhaust gaskets to the cylinder head in their installed position using rubber cement and scribe the outline of the ports on the manifold flanges. Remove the gaskets. Using a small cutter in a hand-held power tool (i.e., Dremel Moto-Tool), gradually taper the walls of the port out to the scribed outline of the gasket. Further enlargement of the ports should include the removal of sharp edges and radiusing of sharp corners. Do not alter the valve guides. NOTE: *The most efficient port configuration is determined only by extensive testing. Therefore, it is best to consult someone experienced with the head in question to determine the optimum alterations.*

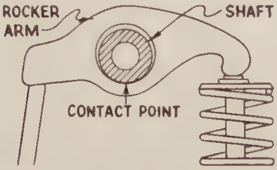
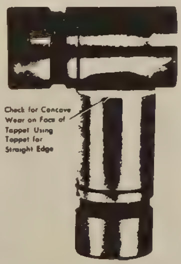
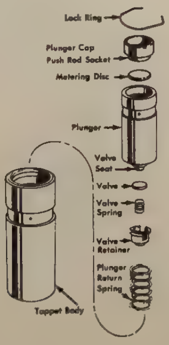
Procedure	*Method*
** Polish the ports:  **Relieved and polished ports** (© Petersen Publishing Co.) **Polished combustion chamber** (© Petersen Publishing Co.)	** Using a grinding stone with the above mentioned tool, polish the walls of the intake and exhaust ports, and combustion chamber. Use progressively finer stones until all surface imperfections are removed. NOTE: *Through testing, it has been determined that a smooth surface is more effective than a mirror polished surface in intake ports, and vice-versa in exhaust ports.*
* Knurling the valve guides: **Cut-away view of a knurled valve guide** (© Petersen Publishing Co.)	* Valve guides which are not excessively worn or distorted may, in some cases, be knurled rather than replaced. Knurling is a process in which metal is displaced and raised, thereby reducing clearance. Knurling also provides excellent oil control. The possibility of knurling rather than replacing valve guides should be discussed with a machinist.
Replacing the valve guides: NOTE: *Valve guides should only be replaced if damaged or if an oversize valve stem is not available.*  A-VALVE GUIDE I.D. B-SLIGHTLY SMALLER THAN VALVE GUIDE O.D. **Valve guide removal tool**  A-VALVE GUIDE I.D. B-LARGER THAN THE VALVE GUIDE O.D. **Valve guide installation tool (with washers used during installation)**	Depending on the type of cylinder head, valve guides may be pressed, hammered, or shrunk in. In cases where the guides are shrunk into the head, replacement should be left to an equipped machine shop. In other cases, the guides are replaced as follows: Press or tap the valve guides out of the head using a stepped drift (see illustration). Determine the height above the boss that the guide must extend, and obtain a stack of washers, their I.D. similar to the guide's O.D., of that height. Place the stack of washers on the guide, and insert the guide into the boss. NOTE: *Valve guides are often tapered or beveled for installation.* Using the stepped installation tool (see illustration), press or tap the guides into position. Ream the guides according to the size of the valve stem.

Procedure	*Method*
Replacing valve seat inserts:	Replacement of valve seat inserts which are worn beyond resurfacing or broken, if feasible, must be done by a machine shop.
Resurfacing (grinding) the valve face: **Grinding a valve** (© Subaru)  CHECK FOR BENT STEM DIAMETER FOR DIMENSIONS, REFER TO SPECIFICATIONS VALVE FACE ANGLE THIS LINE PARALLEL WITH VALVE HEAD 1/32" MINIMUM **Critical valve dimensions** (© Ford Motor Co.)	Using a valve grinder, resurface the valves according to specifications. CAUTION: *Valve face angle is not always identical to valve seat angle.* A minimum margin of 1/32" should remain after grinding the valve. The valve stem tip should also be squared and resurfaced, by placing the stem in the V-block of the grinder, and turning it while pressing lightly against the grinding wheel.
Resurfacing the valve seats using reamers:  **Reaming the valve seat** (© S.p.A. Fiat)  **Valve seat width and centering** (© Ford Motor Co.)	Select a reamer of the correct seat angle, slightly larger than the diameter of the valve seat, and assemble it with a pilot of the correct size. Install the pilot into the valve guide, and using steady pressure, turn the reamer clockwise. CAUTION: *Do not turn the reamer counter-clockwise.* Remove only as much material as necessary to clean the seat. Check the concentricity of the seat (see below). If the dye method is not used, coat the valve face with Prussian blue dye, install and rotate it on the valve seat. Using the dye marked area as a centering guide, center and narrow the valve seat to specifications with correction cutters. NOTE: *When no specifications are available, minimum seat width for exhaust valves should be 5/64", intake valves 1/16"*. After making correction cuts, check the position of the valve seat on the valve face using Prussian blue dye.
* Resurfacing the valve seats using a grinder: **Grinding a valve seat** (© Subaru)	Select a pilot of the correct size, and a coarse stone of the correct seat angle. Lubricate the pilot if necessary, and install the tool in the valve guide. Move the stone on and off the seat at approximately two cycles per second, until all flaws are removed from the seat. Install a fine stone, and finish the seat. Center and narrow the seat using correction stones, as described above.

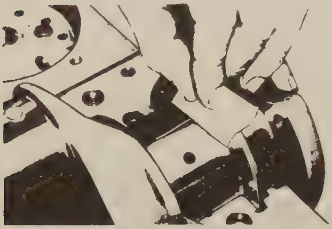
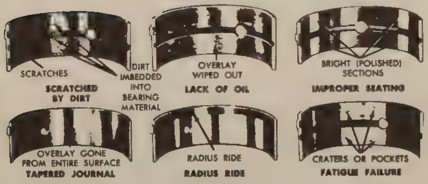
Procedure	*Method*
Checking the valve seat concentricity: Checking the valve seat concentricity using a dial gauge (© American Motors Corp.)	Coat the valve face with Prussian blue dye, install the valve, and rotate it on the valve seat. If the entire seat becomes coated, and the valve is known to be concentric, the seat is concentric. * Install the dial gauge pilot into the guide, and rest the arm on the valve seat. Zero the gauge, and rotate the arm around the seat. Run-out should not exceed .002″.
* Lapping the valves: NOTE: *Valve lapping is done to ensure efficient sealing of resurfaced valves and seats. Valve lapping alone is not recommended for use as a resurfacing procedure.*  Hand lapping the valves  Home made mechanical valve lapping tool	* Invert the cylinder head, lightly lubricate the valve stems, and install the valves in the head as numbered. Coat valve seats with fine grinding compound, and attach the lapping tool suction cup to a valve head (NOTE: *Moisten the suction cup*). Rotate the tool between the palms, changing position and lifting the tool often to prevent grooving. Lap the valve until a smooth, polished seat is evident. Remove the valve and tool, and rinse away all traces of grinding compound. ** Fasten a suction cup to a piece of drill rod, and mount the rod in a hand drill. Proceed as above, using the hand drill as a lapping tool. CAUTION: *Due to the higher speeds involved when using the hand drill, care must be exercised to avoid grooving the seat.* Lift the tool and change direction of rotation often.
Check the valve springs:  Checking the valve spring free length and squareness (© Ford Motor Co.) Checking the valve spring tension (© Chrysler Corp.)	Place the spring on a flat surface next to a square. Measure the height of the spring, and rotate it against the edge of the square to measure distortion. If spring height varies (by comparison) by more than 1/16″ or if distortion exceeds 1/16″, replace the spring. ** In addition to evaluating the spring as above, test the spring pressure at the installed and compressed (installed height minus valve lift) height using a valve spring tester. Springs used on small displacement engines (up to 3 liters) should be ± 1 lb. of all other springs in either position. A tolerance of ± 5 lbs. is permissible on larger engines.

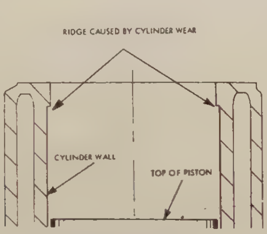
Procedure	*Method*
* Install valve stem seals: **Valve stem seal installation** (© Ford Motor Co.)	* Due to the pressure differential that exists at the ends of the intake valve guides (atmospheric pressure above, manifold vacuum below), oil is drawn through the valve guides into the intake port. This has been alleviated somewhat since the addition of positive crankcase ventilation, which lowers the pressure above the guides. Several types of valve stem seals are available to reduce blow-by. Certain seals simply slip over the stem and guide boss, while others require that the boss be machined. Recently, Teflon guide seals have become popular. Consult a parts supplier or machinist concerning availability and suggested usages. NOTE: *When installing seals, ensure that a small amount of oil is able to pass the seal to lubricate the valve guides; otherwise, excessive wear may result.*
Install the valves:	Lubricate the valve stems, and install the valves in the cylinder head as numbered. Lubricate and position the seals (if used, see above) and the valve springs. Install the spring retainers, compress the springs, and insert the keys using needlenose pliers or a tool designed for this purpose. NOTE: *Retain the keys with wheel bearing grease during installation.*
Checking valve spring installed height:  **Valve spring installed height dimension** (© Porsche) **Measuring valve spring installed height** (© Petersen Publishing Co.)	Measure the distance between the spring pad and the lower edge of the spring retainer, and compare to specifications. If the installed height is incorrect, add shim washers between the spring pad and the spring. CAUTION: *Use only washers designed for this purpose.*
** CC'ing the combustion chambers:	** Invert the cylinder head and place a bead of sealer around a combustion chamber. Install an apparatus designed for this purpose (burette mounted on a clear plate; see illustration) over the combustion chamber, and fill with the specified fluid to an even mark on the burette. Record the burette reading, and fill the combustion chamber with fluid. (NOTE: *A hole drilled in the plate will permit air to escape*). Subtract the burette reading, with the combustion chamber filled, from the previous reading, to determine combustion chamber volume in cc's. Duplicate this procedure in all combustion

Procedure	*Method*
 CC'ing the combustion chamber (© Petersen Publishing Co.)	chambers on the cylinder head, and compare the readings. The volume of all combustion chambers should be made equal to that of the largest. Combustion chamber volume may be increased in two ways. When only a small change is required (usually), a small cutter or coarse stone may be used to remove material from the combustion chamber. NOTE: *Check volume frequently.* Remove material over a wide area, so as not to change the configuration of the combustion chamber. When a larger change is required, the valve seat may be sunk (lowered into the head). NOTE: *When altering valve seat, remember to compensate for the change in spring installed height.*
Inspect the rocker arms, balls, studs, and nuts (where applicable): **Stress cracks in rocker nuts** (© Ford Motor Co.)  	Visually inspect the rocker arms, balls, studs, and nuts for cracks, galling, burning, scoring, or wear. If all parts are intact, liberally lubricate the rocker arms and balls, and install them on the cylinder head. If wear is noted on a rocker arm at the point of valve contact, grind it smooth and square, removing as little material as possible. Replace the rocker arm if excessively worn. If a rocker stud shows signs of wear, it must be replaced (see below). If a rocker nut shows stress cracks, replace it. If an exhaust ball is galled or burned, substitute the intake ball from the same cylinder (if it is intact), and install a new intake ball. NOTE: *Avoid using new rocker balls on exhaust valves.*
Replacing rocker studs: **Reaming the stud bore for oversize rocker studs** (© Buick Div. G.M. Corp.)  AS STUD BEGINS TO PULL UP, IT WILL BE NECESSARY TO REMOVE THE NUT AND ADD MORE WASHERS. **Extracting a pressed in rocker stud** (© Buick Div. G.M. Corp.)	In order to remove a threaded stud, lock two nuts on the stud, and unscrew the stud using the lower nut. Coat the lower threads of the new stud with Loctite, and install. Two alternative methods are available for replacing pressed in studs. Remove the damaged stud using a stack of washers and a nut (see illustration). In the first, the boss is reamed .005-.006″ oversize, and an oversize stud pressed in. Control the stud extension over the boss using washers, in the same manner as valve guides. Before installing the stud, coat it with white lead and grease. To retain the stud more positively, drill a hole through the stud and boss, and install a roll pin. In the second method, the boss is tapped, and a threaded stud installed. Retain the stud using Loctite Stud and Bearing Mount.

Procedure	*Method*
Inspect the rocker shaft(s) and rocker arms (where applicable): Disassembled rocker shaft parts arranged for inspection (© American Motors Corp.)  Rocker arm to rocker shaft contact	Remove rocker arms, springs and washers from rocker shaft. NOTE: *Lay out parts in the order they are removed.* Inspect rocker arms for pitting or wear on the valve contact point, or excessive bushing wear. Bushings need only be replaced if wear is excessive, because the rocker arm normally contacts the shaft at one point only. Grind the valve contact point of rocker arm smooth if necessary, removing as little material as possible. If excessive material must be removed to smooth and square the arm, it should be replaced. Clean out all oil holes and passages in rocker shaft. If shaft is grooved or worn, replace it. Lubricate and assemble the rocker shaft.
Inspect the camshaft bushings and the camshaft (overhead cam engines):	See next section.
Inspect the pushrods:	Remove the pushrods, and, if hollow, clean out the oil passages using fine wire. Roll each pushrod over a piece of clean glass. If a distinct clicking sound is heard as the pushrod rolls, the rod is bent, and must be replaced.
	* The length of all pushrods must be equal. Measure the length of the pushrods, compare to specifications, and replace as necessary.
Inspect the valve lifters:  Check for Concave Wear on Face of Tappet Using Tappet for Straight Edge Checking the lifter face (© American Motors Corp.)	Remove lifters from their bores, and remove gum and varnish, using solvent. Clean walls of lifter bores. Check lifters for concave wear as illustrated. If face is worn concave, replace lifter, and carefully inspect the camshaft. Lightly lubricate lifter and insert it into its bore. If play is excessive, an oversize lifter must be installed (where possible). Consult a machinist concerning feasibility. If play is satisfactory, remove, lubricate, and reinstall the lifter.
* Testing hydraulic lifter leak down:  Lock Ring Plunger Cap Push Rod Socket Metering Disc Plunger Valve Seat Valve Valve Spring Valve Retainer Plunger Return Spring Tappet Body Exploded view of a typical hydraulic lifter (© American Motors Corp.)	Submerge lifter in a container of kerosene. Chuck a used pushrod or its equivalent into a drill press. Position container of kerosene so pushrod acts on the lifter plunger. Pump lifter with the drill press, until resistance increases. Pump several more times to bleed any air out of lifter. Apply very firm, constant pressure to the lifter, and observe rate at which fluid bleeds out of lifter. If the fluid bleeds very quickly (less than 15 seconds), lifter is defective. If the time exceeds 60 seconds, lifter is sticking. In either case, recondition or replace lifter. If lifter is operating properly (leak down time 15-60 seconds), lubricate and install it.

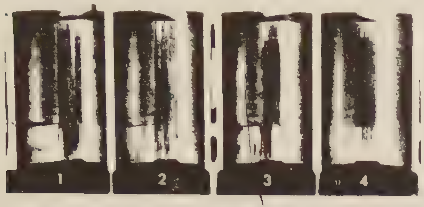
CYLINDER BLOCK RECONDITIONING

Procedure	*Method*
Checking the main bearing clearance: Plastigage installed on main bearing journal (© Chevrolet Div. G.M. Corp.)  Measuring Plastigage to determine main bearing clearance (© Chevrolet Div. G.M. Corp.)	Invert engine, and remove cap from the bearing to be checked. Using a clean, dry rag, thoroughly clean all oil from crankshaft journal and bearing insert. NOTE: *Plastigage is soluble in oil; therefore, oil on the journal or bearing could result in erroneous readings.* Place a piece of Plastigage along the full length of journal, reinstall cap, and torque to specifications. Remove bearing cap, and determine bearing clearance by comparing width of Plastigage to the scale on Plastigage envelope. Journal taper is determined by comparing width of the Plastigage strip near its ends. Rotate crankshaft 90° and retest, to determine journal eccentricity. NOTE: *Do not rotate crankshaft with Plastigage installed.* If bearing insert and journal appear intact, and are within tolerances, no further main bearing service is required. If bearing or journal appear defective, cause of failure should be determined before replacement.
 SCRATCHES DIRT IMBEDDED INTO BEARING MATERIAL SCRATCHED BY DIRT OVERLAY WIPED OUT LACK OF OIL BRIGHT (POLISHED) SECTIONS IMPROPER SEATING OVERLAY GONE FROM ENTIRE SURFACE TAPERED JOURNAL RADIUS RIDE RADIUS RIDE CRATERS OR POCKETS FATIGUE FAILURE Causes of bearing failure (© Ford Motor Co.)	* Remove crankshaft from block (see below). Measure the main bearing journals at each end twice (90° apart) using a micrometer, to determine diameter, journal taper and eccentricity. If journals are within tolerances, reinstall bearing caps at their specified torque. Using a telescope gauge and micrometer, measure bearing I.D. parallel to piston axis and at 30° on each side of piston axis. Subtract journal O.D. from bearing I.D. to determine oil clearance. If crankshaft journals appear defective, or do not meet tolerances, there is no need to measure bearings; for the crankshaft will require grinding and/or undersize bearings will be required. If bearing appears defective, cause for failure should be determined prior to replacement.
Checking the connecting rod bearing clearance: Plastigage installed on connecting rod bearing journal (© Chevrolet Div. G.M. Corp.)	Connecting rod bearing clearance is checked in the same manner as main bearing clearance, using Plastigage. Before removing the crankshaft, connecting rod side clearance also should be measured and recorded.
	* Checking connecting rod bearing clearance, using a micrometer, is identical to checking main bearing clearance. If no other service

Procedure	*Method*
 Measuring Plastigage to determine connecting rod bearing clearance (© Chevrolet Div. G.M. Corp.)	is required, the piston and rod assemblies need not be removed.
Removing the crankshaft: **Connecting rod matching marks** (© Ford Motor Co.)	Using a punch, mark the corresponding main bearing caps and saddles according to position (i.e., one punch on the front main cap and saddle, two on the second, three on the third, etc.). Using number stamps, identify the corresponding connecting rods and caps, according to cylinder (if no numbers are present). Remove the main and connecting rod caps, and place sleeves of plastic tubing over the connecting rod bolts, to protect the journals as the crankshaft is removed. Lift the crankshaft out of the block.
Remove the ridge from the top of the cylinder:  RIDGE CAUSED BY CYLINDER WEAR CYLINDER WALL TOP OF PISTON **Cylinder bore ridge** (© Pontiac Div. G.M. Corp.)	In order to facilitate removal of the piston and connecting rod, the ridge at the top of the cylinder (unworn area; see illustration) must be removed. Place the piston at the bottom of the bore, and cover it with a rag. Cut the ridge away using a ridge reamer, exercising extreme care to avoid cutting too deeply. Remove the rag, and remove cuttings that remain on the piston. CAUTION: *If the ridge is not removed, and new rings are installed, damage to rings will result.*
Removing the piston and connecting rod: **Removing the piston** (© SAAB)	Invert the engine, and push the pistons and connecting rods out of the cylinders. If necessary, tap the connecting rod boss with a wooden hammer handle, to force the piston out. CAUTION: *Do not attempt to force the piston past the cylinder ridge* (see above).

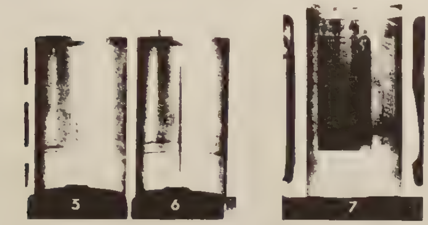
Procedure	*Method*
Service the crankshaft:	Ensure that all oil holes and passages in the crankshaft are open and free of sludge. If necessary, have the crankshaft ground to the largest possible undersize.
	** Have the crankshaft Magnafluxed, to locate stress cracks. Consult a machinist concerning additional service procedures, such as surface hardening (e.g., nitriding, Tuftriding) to improve wear characteristics, cross drilling and chamfering the oil holes to improve lubrication, and balancing.
Removing freeze plugs:	Drill a hole in the center of the freeze plugs, and pry them out using a screwdriver or drift.
Remove the oil gallery plugs:	Threaded plugs should be removed using an appropriate (usually square) wrench. To remove soft, pressed in plugs, drill a hole in the plug, and thread in a sheet metal screw. Pull the plug out by the screw using pliers.
Hot-tank the block:	Have the block hot-tanked to remove grease, corrosion, and scale from the water jackets. NOTE: *Consult the operator to determine whether the camshaft bearings will be damaged during the hot-tank process.*
Check the block for cracks:	Visually inspect the block for cracks or chips. The most common locations are as follows: Adjacent to freeze plugs. Between the cylinders and water jackets. Adjacent to the main bearing saddles. At the extreme bottom of the cylinders. Check only suspected cracks using spot check dye (see introduction). If a crack is located, consult a machinist concerning possible repairs.
	** Magnaflux the block to locate hidden cracks. If cracks are located, consult a machinist about feasibility of repair.
Install the oil gallery plugs and freeze plugs:	Coat freeze plugs with sealer and tap into position using a piece of pipe, slightly smaller than the plug, as a driver. To ensure retention, stake the edges of the plugs. Coat threaded oil gallery plugs with sealer and install. Drive replacement soft plugs into block using a large drift as a driver.
	* Rather than reinstalling lead plugs, drill and tap the holes, and install threaded plugs.

Procedure	*Method*
Check the bore diameter and surface:	Visually inspect the cylinder bores for roughness, scoring, or scuffing. If evident, the cylinder bore must be bored or honed oversize to eliminate imperfections, and the smallest possible oversize piston used. The new pistons should be given to the machinist with the block, so that the cylinders can be bored or honed exactly to the piston size (plus clearance). If no flaws are evident, measure the bore diameter using a telescope gauge and micrometer, or dial gauge, parallel and perpendicular to the engine centerline, at the top (below the ridge) and bottom of the bore. Subtract the bottom measurements from the top to determine taper, and the parallel to the centerline measurements from the perpendicular measurements to determine eccentricity. If the measurements are not within specifications, the cylinder must be bored or honed, and an oversize piston installed. If the measurements are within specifications the cylinder may be used as is, with only finish honing (see below). NOTE: *Prior to submitting the block for boring, perform the following operation(s).*



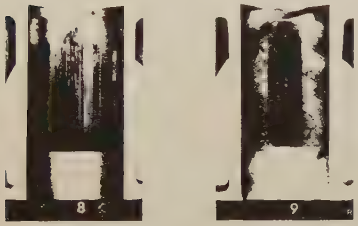
1, 2, 3 Piston skirt seizure resulted in this pattern. Engine must be rebored

4. Piston skirt and oil ring seizure caused this damage. Engine must be rebored



5, 6 Score marks caused by a split piston skirt. Damage is not serious enough to warrant reboring

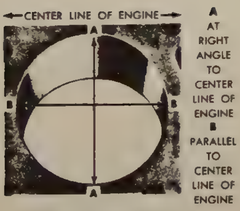
7. Ring seized longitudinally, causing a score mark 1 3/16" wide, on the land side of the piston groove. The honing pattern is destroyed and the cylinder must be rebored



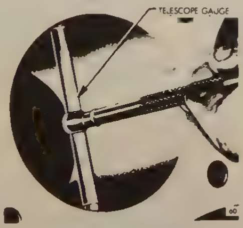
8. Result of oil ring seizure. Engine must be rebored

9. Oil ring seizure here was not serious enough to warrant reboring. The honing marks are still visible

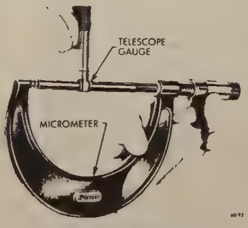
Cylinder wall damage
(© Daimler-Benz A.G.)


CENTER LINE OF ENGINE
A
B
B
A
A AT RIGHT ANGLE TO CENTER LINE OF ENGINE
B PARALLEL TO CENTER LINE OF ENGINE

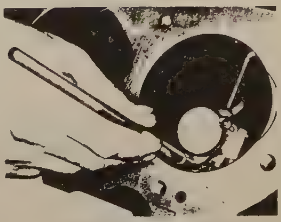
Cylinder bore measuring positions
(© Ford Motor Co.)



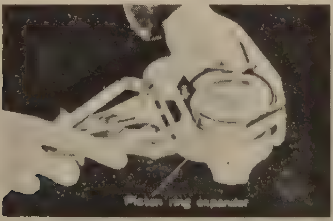
Measuring the cylinder bore with a telescope gauge
(© Buick Div. G.M. Corp.)

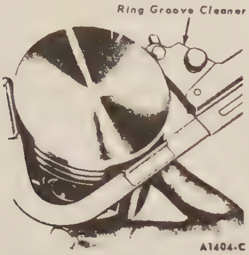
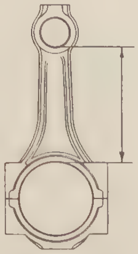
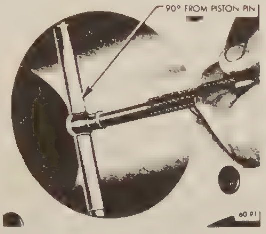


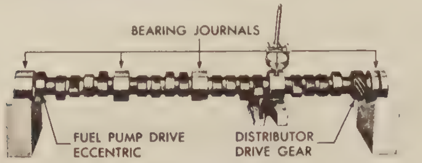
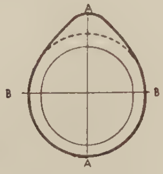
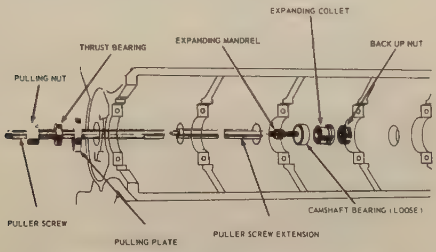
Determining the cylinder bore by measuring the telescope gauge with a micrometer
(© Buick Div. G.M. Corp.)

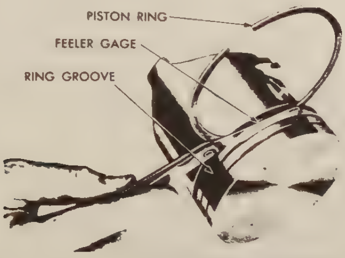
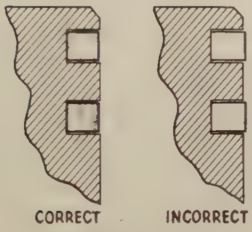
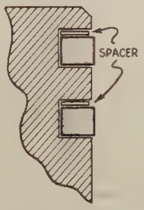
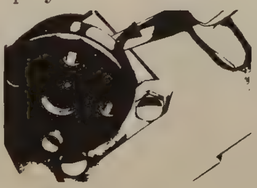


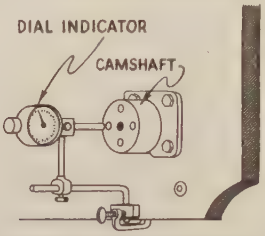
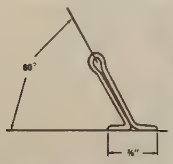
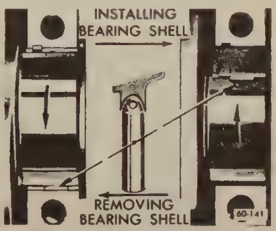
Measuring the cylinder bore with a dial gauge
(© Chevrolet Div. G.M. Corp.)

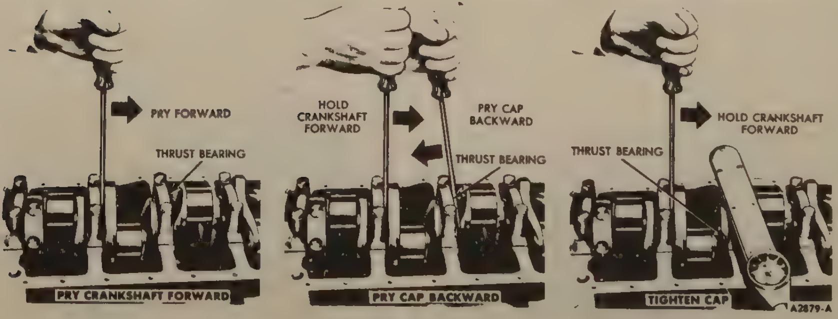
Procedure	*Method*
Check the block deck for warpage:	Using a straightedge and feeler gauges, check the block deck for warpage in the same manner that the cylinder head is checked (see Cylinder Head Reconditioning). If warpage exceeds specifications, have the deck resurfaced. NOTE: *In certain cases a specification for total material removal (Cylinder head and block deck) is provided. This specification must not be exceeded.*
* Check the deck height:	The deck height is the distance from the crankshaft centerline to the block deck. To measure, invert the engine, and install the crankshaft, retaining it with the center main cap. Measure the distance from the crankshaft journal to the block deck, parallel to the cylinder centerline. Measure the diameter of the end (front and rear) main journals, parallel to the centerline of the cylinders, divide the diameter in half, and subtract it from the previous measurement. The results of the front and rear measurements should be identical. If the difference exceeds .005″, the deck height should be corrected. NOTE: *Block deck height and warpage should be corrected concurrently.*
Check the cylinder block bearing alignment: **Checking main bearing saddle alignment** (© Petersen Publishing Co.)	Remove the upper bearing inserts. Place a straightedge in the bearing saddles along the centerline of the crankshaft. If clearance exists between the straightedge and the center saddle, the block must be alignbored.
Clean and inspect the pistons and connecting rods:  **Removing the piston rings** (© Subaru)	Using a ring expander, remove the rings from the piston. Remove the retaining rings (if so equipped) and remove piston pin. NOTE: *If the piston pin must be pressed out, determine the proper method and use the proper tools; otherwise the piston will distort.* Clean the ring grooves using an appropriate tool, exercising care to avoid cutting too deeply. Thoroughly clean all carbon and varnish from the piston with solvent. CAUTION: *Do not use a wire brush or caustic solvent on pistons.* Inspect the pistons for scuffing, scoring, cracks, pitting, or excessive ring groove wear. If wear is evident, the piston must be replaced. Check the connecting rod length by measuring the rod from the inside of the large end to the inside of the small end using calipers (see

Procedure	*Method*
 Cleaning the piston ring grooves (© Ford Motor Co.)  Connecting rod length checking dimension	illustration). All connecting rods should be equal length. Replace any rod that differs from the others in the engine. * Have the connecting rod alignment checked in an alignment fixture by a machinist. Replace any twisted or bent rods. * Magnaflux the connecting rods to locate stress cracks. If cracks are found, replace the connecting rod.
Fit the pistons to the cylinders:  Measuring the cylinder with a telescope gauge for piston fitting (© Buick Div. G.M. Corp.) Measuring the piston for fitting (© Buick Div. G.M. Corp.)	Using a telescope gauge and micrometer, or a dial gauge, measure the cylinder bore diameter perpendicular to the piston pin, 2½″ below the deck. Measure the piston perpendicular to its pin on the skirt. The difference between the two measurements is the piston clearance. If the clearance is within specifications or slightly below (after boring or honing), finish honing is all that is required. If the clearance is excessive, try to obtain a slightly larger piston to bring clearance within specifications. Where this is not possible, obtain the first oversize piston, and hone (or if necessary, bore) the cylinder to size.
Assemble the pistons and connecting rods: Installing piston pin lock rings (© Nissan Motor Co., Ltd.)	Inspect piston pin, connecting rod small end bushing, and piston bore for galling, scoring, or excessive wear. If evident, replace defective part(s). Measure the I.D. of the piston boss and connecting rod small end, and the O.D. of the piston pin. If within specifications, assemble piston pin and rod. CAUTION: *If piston pin must be pressed in, determine the proper method and use the proper tools; otherwise the piston will distort.* Install the lock rings; ensure that they seat properly. If the parts are not within specifications, determine the service method for the type of engine. In some cases, piston and pin are serviced as an assembly when either is defective. Others specify reaming the piston and connecting rods for an oversize pin. If the connecting rod bushing is worn, it may in many cases be replaced. Reaming the piston and replacing the rod bushing are machine shop operations.

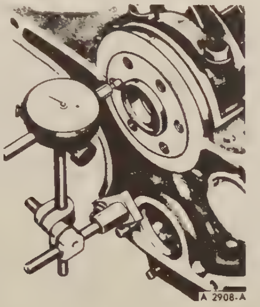
Procedure	*Method*
Clean and inspect the camshaft:  BEARING JOURNALS FUEL PUMP DRIVE ECCENTRIC DISTRIBUTOR DRIVE GEAR **Checking the camshaft for straightness** (© Chevrolet Motor Div. G.M. Corp.)	Degrease the camshaft, using solvent, and clean out all oil holes. Visually inspect cam lobes and bearing journals for excessive wear. If a lobe is questionable, check all lobes as indicated below. If a journal or lobe is worn, the camshaft must be reground or replaced. NOTE: *If a journal is worn, there is a good chance that the bushings are worn.* If lobes and journals appear intact, place the front and rear journals in V-blocks, and rest a dial indicator on the center journal. Rotate the camshaft to check straightness. If deviation exceeds .001″, replace the camshaft.
 **Camshaft lobe measurement** (© Ford Motor Co.)	* Check the camshaft lobes with a micrometer, by measuring the lobes from the nose to base and again at 90° (see illustration). The lift is determined by subtracting the second measurement from the first. If all exhaust lobes and all intake lobes are not identical, the camshaft must be reground or replaced.
Replace the camshaft bearings:  EXPANDING COLLET THRUST BEARING EXPANDING MANDREL BACK UP NUT PULLING NUT CAMSHAFT BEARING (LOOSE) PULLER SCREW PULLER SCREW EXTENSION PULLING PLATE **Camshaft removal and installation tool (typical)** (© Ford Motor Co.)	If excessive wear is indicated, or if the engine is being completely rebuilt, camshaft bearings should be replaced as follows: Drive the camshaft rear plug from the block. Assemble the removal puller with its shoulder on the bearing to be removed. Gradually tighten the puller nut until bearing is removed. Remove remaining bearings, leaving the front and rear for last. To remove front and rear bearings, reverse position of the tool, so as to pull the bearings in toward the center of the block. Leave the tool in this position, pilot the new front and rear bearings on the installer, and pull them into position. Return the tool to its original position and pull remaining bearings into position. NOTE: *Ensure that oil holes align when installing bearings.* Replace camshaft rear plug, and stake it into position to aid retention.
Finish hone the cylinders: CROSS HATCH PATTERN **Finish honed cylinder** (© Chrysler Corp.)	Chuck a flexible drive hone into a power drill, and insert it into the cylinder. Start the hone, and move it up and down in the cylinder at a rate which will produce approximately a 60° cross-hatch pattern (see illustration). NOTE: *Do not extend the hone below the cylinder bore.* After developing the pattern, remove the hone and recheck piston fit. Wash the cylinders with a detergent and water solution to remove abrasive dust, dry, and wipe several times with a rag soaked in engine oil.

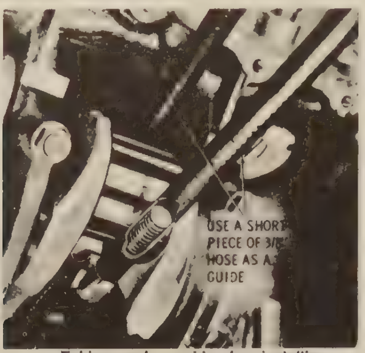
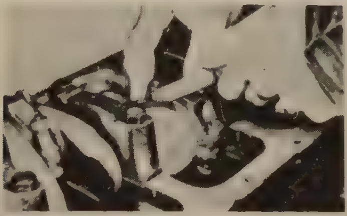
Procedure	*Method*
Check piston ring end-gap: Checking ring end-gap (© Chevrolet Motor Div. G.M. Corp.)	Compress the piston rings to be used in a cylinder, one at a time, into that cylinder, and press them approximately 1″ below the deck with an inverted piston. Using feeler gauges, measure the ring end-gap, and compare to specifications. Pull the ring out of the cylinder and file the ends with a fine file to obtain proper clearance. CAUTION: *If inadequate ring end-gap is utilized, ring breakage will result.*
Install the piston rings:  Checking ring side clearance (© Chrysler Corp.)  Piston groove depth  Correct ring spacer installation	Inspect the ring grooves in the piston for excessive wear or taper. If necessary, recut the groove(s) for use with an overwidth ring or a standard ring and spacer. If the groove is worn uniformly, overwidth rings, or standard rings and spacers may be installed without recutting. Roll the outside of the ring around the groove to check for burrs or deposits. If any are found, remove with a fine file. Hold the ring in the groove, and measure side clearance. If necessary, correct as indicated above. NOTE: *Always install any additional spacers above the piston ring.* The ring groove must be deep enough to allow the ring to seat below the lands (see illustration). In many cases, a "go-no-go" depth gauge will be provided with the piston rings. Shallow grooves may be corrected by recutting, while deep grooves require some type of filler or expander behind the piston. Consult the piston ring supplier concerning the suggested method. Install the rings on the piston, lowest ring first, using a ring expander. NOTE: *Position the ring markings as specified by the manufacturer (see car section).*
Install the camshaft:	Liberally lubricate the camshaft lobes and journals, and slide the camshaft into the block. CAUTION: *Exercise extreme care to avoid damaging the bearings when inserting the camshaft.* Install and tighten the camshaft thrust plate retaining bolts.
Check camshaft end-play:  Checking camshaft end-play with a feeler gauge (© Ford Motor Co.)	Using feeler gauges, determine whether the clearance between the camshaft boss (or gear) and backing plate is within specifications. Install shims behind the thrust plate, or reposition the camshaft gear and retest end-play.

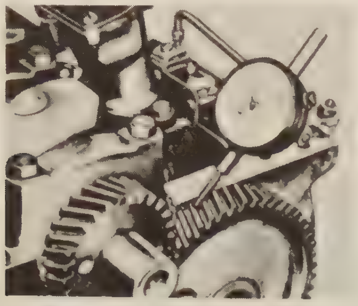
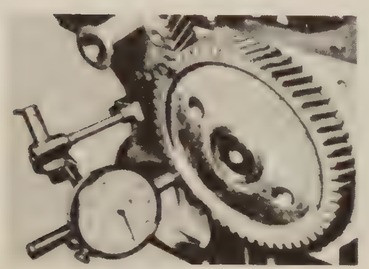
Procedure	*Method*
 DIAL INDICATOR CAMSHAFT **Checking camshaft end-play with a dial indicator**	* Mount a dial indicator stand so that the stem of the dial indicator rests on the nose of the camshaft, parallel to the camshaft axis. Push the camshaft as far in as possible and zero the gauge. Move the camshaft outward to determine the amount of camshaft end-play. If the end-play is not within tolerance, install shims behind the thrust plate, or reposition the camshaft gear and retest.
Install the rear main seal (where applicable): **Seating the rear main seal (© Buick Div. G.M. Corp.)**	Position the block with the bearing saddles facing upward. Lay the rear main seal in its groove and press it lightly into its seat. Place a piece of pipe the same diameter as the crankshaft journal into the saddle, and firmly seat the seal. Hold the pipe in position, and trim the ends of the seal flush if required.
Install the crankshaft:  **Home made bearing roll-out pin (© Pontiac Div. G.M. Corp.)**  INSTALLING BEARING SHELL REMOVING BEARING SHELL 60-141 **Removal and installation of upper bearing insert using a roll-out pin (© Buick Div. G.M. Corp.)**	Thoroughly clean the main bearing saddles and caps. Place the upper halves of the bearing inserts on the saddles and press into position. NOTE: *Ensure that the oil holes align.* Press the corresponding bearing inserts into the main bearing caps. Lubricate the upper main bearings, and lay the crankshaft in position. Place a strip of Plastigage on each of the crankshaft journals, install the main caps, and torque to specifications. Remove the main caps, and compare the Plastigage to the scale on the Plastigage envelope. If clearances are within tolerances, remove the Plastigage, turn the crankshaft 90°, wipe off all oil and retest. If all clearances are correct, remove all Plastigage, thoroughly


PRY FORWARD
THRUST BEARING
PRY CRANKSHAFT FORWARD
HOLD CRANKSHAFT FORWARD
PRY CAP BACKWARD
THRUST BEARING
PRY CAP BACKWARD
HOLD CRANKSHAFT FORWARD
THRUST BEARING
TIGHTEN CAP
A2879-A

Aligning the thrust bearing
(© Ford Motor Co.)

Procedure	*Method*
	lubricate the main caps and bearing journals, and install the main caps. If clearances are not within tolerance, the upper bearing inserts may be removed, without removing the crankshaft, using a bearing roll out pin (see illustration). Roll in a bearing that will provide proper clearance, and retest. Torque all main caps, excluding the thrust bearing cap, to specifications. Tighten the thrust bearing cap finger tight. To properly align the thrust bearing, pry the crankshaft the extent of its axial travel several times, the last movement held toward the front of the engine, and torque the thrust bearing cap to specifications. Determine the crankshaft end-play (see below), and bring within tolerance with thrust washers.
Measure crankshaft end-play:  **Checking crankshaft end-play with a dial indicator (© Ford Motor Co.)** **Checking crankshaft end-play with a feeler gauge (© Chevrolet Div. (G.M. Corp.)**	Mount a dial indicator stand on the front of the block, with the dial indicator stem resting on the nose of the crankshaft, parallel to the crankshaft axis. Pry the crankshaft the extent of its travel rearward, and zero the indicator. Pry the crankshaft forward and record crankshaft end-play. NOTE: *Crankshaft end-play also may be measured at the thrust bearing, using feeler gauges* (see illustration).
Install the pistons:	Press the upper connecting rod bearing halves into the connecting rods, and the lower halves into the connecting rod caps. Position the piston ring gaps according to specifications (see car section), and lubricate the pistons. Install a ring compresser on a piston, and press two long (8″) pieces of plastic tubing over the rod bolts. Using the plastic tubes as a guide, press the pistons into the bores and onto the crankshaft with a wooden hammer handle. After seating the rod on the crankshaft journal, remove the tubes and install the cap finger tight. Install the remaining pistons in the same man-

Procedure	*Method*
 **Tubing used as guide when installing a piston** (© Oldsmobile Div. G.M. Corp.) **Installing a piston** (© Chevrolet Div. G.M. Corp.)	ner. Invert the engine and check the bearing clearance at two points (90° apart) on each journal with Plastigage. NOTE: *Do not turn the crankshaft with Plastigage installed.* If clearance is within tolerances, remove *all* Plastigage, thoroughly lubricate the journals, and torque the rod caps to specifications. If clearance is not within specifications, install different thickness bearing inserts and recheck. CAUTION: *Never shim or file the connecting rods or caps.* Always install plastic tube sleeves over the rod bolts when the caps are not installed, to protect the crankshaft journals.
Check connecting rod side clearance:  **Checking connecting rod side clearance** (© Chevrolet Div. G.M. Corp.)	Determine the clearance between the sides of the connecting rods and the crankshaft, using feeler gauges. If clearance is below the minimum tolerance, the rod may be machined to provide adequate clearance. If clearance is excessive, substitute an unworn rod, and recheck. If clearance is still outside specifications, the crankshaft must be welded and reground, or replaced.
Inspect the timing chain:	Visually inspect the timing chain for broken or loose links, and replace the chain if any are found. If the chain will flex sideways, it must be replaced. Install the timing chain as specified. NOTE: *If the original timing chain is to be reused, install it in its original position.*

Procedure	*Method*
Check timing gear backlash and runout:  **Checking camshaft gear backlash** (© Chevrolet Div. G.M. Corp.)  **Checking camshaft gear runout** (© Chevrolet Div. G.M. Corp.)	Mount a dial indicator with its stem resting on a tooth of the camshaft gear (as illustrated). Rotate the gear until all slack is removed, and zero the indicator. Rotate the gear in the opposite direction until slack is removed, and record gear backlash. Mount the indicator with its stem resting on the edge of the camshaft gear, parallel to the axis of the camshaft. Zero the indicator, and turn the camshaft gear one full turn, recording the runout. If either backlash or runout exceed specifications, replace the worn gear(s).

Completing the Rebuilding Process

Following the above procedures, complete the rebuilding process as follows:

Fill the oil pump with oil, to prevent cavitating (sucking air) on initial engine start up. Install the oil pump and the pickup tube on the engine. Coat the oil pan gasket as necessary, and install the gasket and the oil pan. Mount the flywheel and the crankshaft vibrational damper or pulley on the crankshaft. NOTE: *Always use new bolts when installing the flywheel.* Inspect the clutch shaft pilot bushing in the crankshaft. If the bushing is excessively worn, remove it with an expanding puller and a slide hammer, and tap a new bushing into place.

Position the engine, cylinder head side up. Lubricate the lifters, and install them into their bores. Install the cylinder head, and torque it as specified in the car section. Insert the pushrods (where applicable), and install the rocker shaft(s) (if so equipped) or position the rocker arms on the pushrods. If solid lifters are utilized, adjust the valves to the "cold" specifications.

Mount the intake and exhaust manifolds, the carburetor(s), the distributor and spark plugs. Adjust the point gap and the static ignition timing. Mount all accessories and install the engine in the car. Fill the radiator with coolant, and the crankcase with high quality engine oil.

Break-in Procedure

Start the engine, and allow it to run at low speed for a few minutes, while checking for leaks. Stop the engine, check the oil level, and fill as necessary. Restart the engine, and fill the cooling system to capacity. Check the point dwell angle and adjust the ignition timing and the valves. Run the engine at low to medium speed (800-2500 rpm) for approximately ½ hour, and retorque the cylinder head bolts. Road test the car, and check again for leaks.

Follow the manufacturer's recommended engine break-in procedure and maintenance schedule for new engines.

4 · Emission Controls and Fuel System

Emission Controls

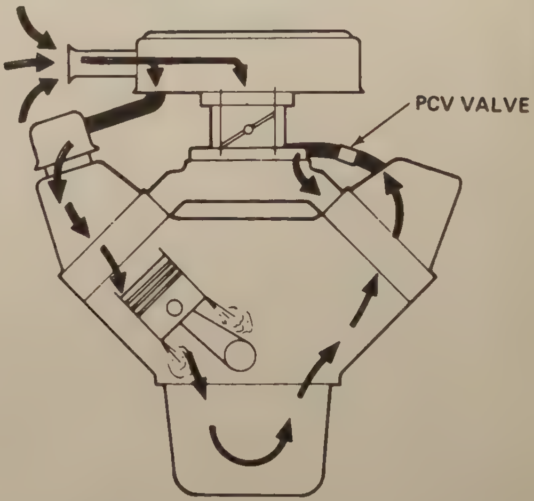
There are 3 basic sources of automotive pollution in the modern internal combustion engine. They are the crankcase with its accompanying blow-by vapors, the fuel system with its evaporation of unburned gasoline, and the combustion chambers with their resulting exhaust emissions. Pollution arising from the incomplete combustion of fuel generally falls into 3 categories; hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NO_x).

POSITIVE CRANKCASE VENTILATION SYSTEM

All Mavericks and Comets are equipped with a positive crankcase ventilation (PCV) system to control crankcase blow-by vapors. The system consists of a PCV valve and oil separator mounted on top of the valve cover, a non-ventilated oil filter cap, and a pair of hoses supplying filtered intake air to the valve cover and delivering the crankcase vapors from the valve cover to the intake manifold (six-cylinder) or carburetor (V8).

The system functions as follows:

When the engine is running, a small portion of the gases which are formed in the combustion chamber leak by the piston rings and enter the crankcase. Since these gases are under pressure, they tend to escape from the crankcase and enter the atmosphere. If these gases are allowed to remain in the crankcase for any period of time, they contaminate the engine oil and cause sludge to build up in the crankcase. If the gases are allowed to escape into the atmosphere, they pollute the air, with unburned hydrocarbons. The job of the crankcase emission control equipment is to



Positive Crankcase Ventilation System Operation (V8 shown) recycle these gases back into the engine combustion chamber where they are reburned.

The crankcase (blow-by) gases are recycled in the following way: as the engine is running, clean, filtered air is drawn through the air filter and into the crankcase. As the air passes through the crankcase, it picks up the combustion gases and carries them out of the crankcase, through the oil separator, through the PCV valve, and into the induction system. As they enter the intake manifold, they are drawn into the combustion chamber where they are reburned.

The most critical component in the system is the PCV valve. This valve controls the amount of gases which are recycled into the combustion chamber. At low engine speeds, the valve is partially closed, limiting the flow of the gases into the intake manifold. As engine speed increases, the valve opens to admit greater quantities of the gases into the intake manifold. If the valve should become blocked or plugged, the gases will be prevented from escaping from the crankcase by the normal route. Since these gases are under pressure, they will find their own way out of the crankcase. This alternate route is usually a weak oil seal or gasket in the engine. As the gas escapes by the gasket, it also creates an oil leak. Besides causing oil leaks, a clogged PCV valve also allows these gases to remain in the crankcase for an extended period of time, promoting the formation of sludge in the engine.

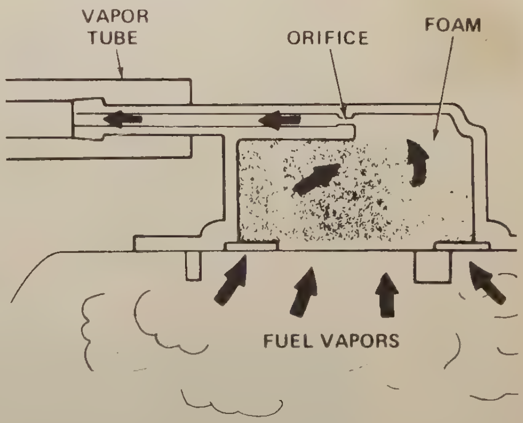
FUEL EVAPORATIVE CONTROL SYSTEM

1970 Mavericks manufactured for sale in California, and all 1971–76 Mavericks and Comets are equipped with a fuel evaporative control system to prevent the evaporation of unburned gasoline. The 1970 system consists of a sealed fuel tank filler cap, an expansion area at the top of the gas tank, a combination vapor separator and expansion tank assembly, a 3-way vapor control valve, a carbon canister located in the engine compartment which stores these vapors, and the hoses which connect this equipment. The 1971–76 system consists of a special vacuum/pressure relief filler cap, an expansion area at the top of the fuel tank, a foam-filled vapor separator mounted on top of the fuel tank, a carbon canister which stores fuel vapors and hoses which connect this equipment. On both systems, the carburetor fuel bowl vapors are retained within the fuel bowl until the engine is started, at which point they are internally vented into the engine for burning.

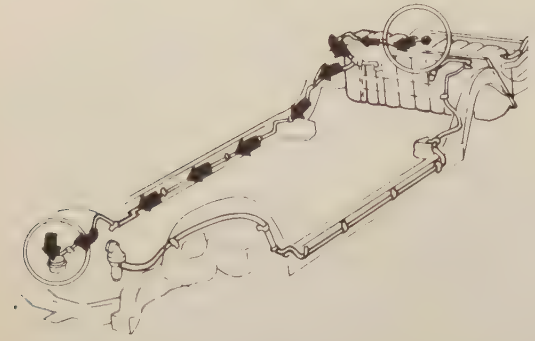
The system functions as follows:

Changes in atmospheric temperature cause the gasoline in fuel tanks to expand or contract. If this expansion and consequent vaporization takes place in a conventional fuel tank, the fuel vapors escape through the filler cap or vent hose and pollute the atmosphere. The fuel evaporative emission control system prevents this by routing the gasoline vapors to the engine where they are burned.

As the gasoline in the fuel tank of a parked car begins to expand due to heat, the vapor that forms moves to the top of the fuel tank. The fuel tanks on all 1970 and later cars are enlarged so that there exists an area representing 10–20% of the total fuel tank volume above the level of the fuel tank filler tube where these gasses may collect. The vapors then travel upward into the vapor separator which prevents liquid gasoline from escaping from the fuel tank. The fuel vapor is then drawn through the vapor separator outlet hose, through the 3-way vapor control valve (1970 only), then to the charcoal canister in the engine compartment. The vapor enters the canister, passes through a charcoal filter, and then exits through the canister's grated bottom. As the vapor passes through the charcoal, it is cleansed by hydrocarbons, so that the air that passes out of the



Fuel Vapors Entering Vapor Separator



Routing of Fuel Tank Vapors

bottom of the canister is free of pollutants.

When the engine is started, vacuum from the carburetor draws fresh air into the canister. As the entering air passes through the charcoal in the canister, it picks up the hydrocarbons that were deposited there by the fuel vapors. This mixture of hydrocarbons and fresh air is then carried through a hose to the air cleaner. In the carburetor, it combines with the incoming air/fuel mixture and enters the combustion chambers of the engine where it is burned.

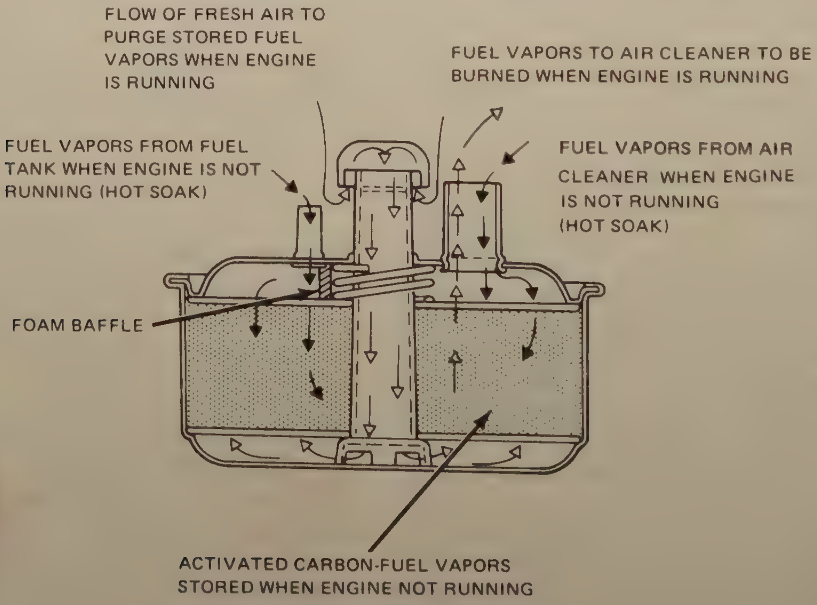
On both systems, there still remains the problem of allowing air into the tank to replace the gasoline displaced during normal use and the problem of relieving excess pressure from the fuel tank should it reach a dangerous level. On 1970 systems, the 3-way control valve accomplishes this. On 1971–76 systems, the special filler cap performs this task. Under normal circumstances, the filler cap functions as a check valve, allowing air to enter the tank to replace the fuel consumed. At the same time it prevents vapors from escaping from the cap. In case of severe pressure within the tank, the filler cap valve opens, venting the pollutants to the atmosphere.

IMPROVED COMBUSTION SYSTEM

All Mavericks and Comets, regardless of other exhaust emission control equipment, are equipped with the Improved Combustion (IMCO) System for controlling emissions arising from the incomplete combustion of fuel. The IMCO system incorporates a number of modifications to the distributor spark control system, the fuel system, and the internal design of the engine.

Internal engine modifications include the following: elimination of surface irregularities and crevices as well as a low surface area-to-volume ratio in the combustion chambers, a high-velocity intake manifold combined with short exhaust ports, selective valve timing and a higher temperature and capacity cooling system.

Modifications to the fuel system include the following: recalibrated carburetors to achieve a leaner air/fuel mixture, more precise calibration of the choke mechanism, the installation of idle mixture limiter caps and a heated air intake system.


FLOW OF FRESH AIR TO PURGE STORED FUEL VAPORS WHEN ENGINE IS RUNNING
FUEL VAPORS TO AIR CLEANER TO BE BURNED WHEN ENGINE IS RUNNING
FUEL VAPORS FROM FUEL TANK WHEN ENGINE IS NOT RUNNING (HOT SOAK)
FUEL VAPORS FROM AIR CLEANER WHEN ENGINE IS NOT RUNNING (HOT SOAK)
FOAM BAFFLE
ACTIVATED CARBON-FUEL VAPORS STORED WHEN ENGINE NOT RUNNING

Cross-section of Charcoal Canister

Modifications to the distributor spark control system include the following: a modified centrifugal advance curve, the use of dual diaphragm distributors in most applications, a ported vacuum switch and a spark delay valve (some 1972 and later models).

Heated Air Intake System

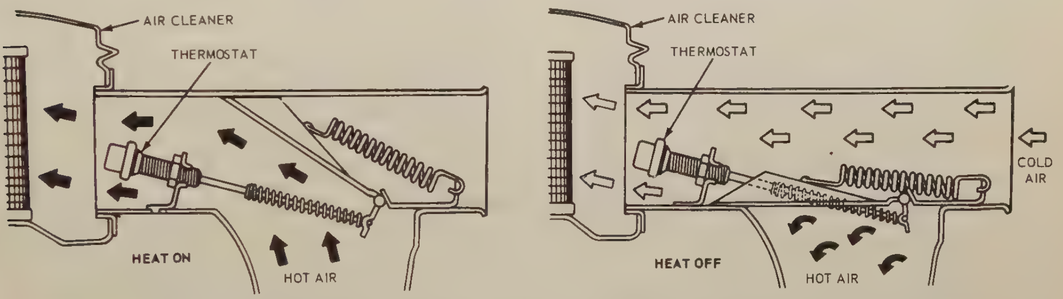
The heated air intake portion of the air cleaner consists of a thermostat (1970–72 models), or bimetal switch (1973–76 models), and vacuum motor (1973–76 models), and a spring-loaded temperature control door in the snorkel of the air cleaner. The temperature control door is located between the end of the air cleaner snorkel which draws in air from the engine compartment and the duct that carries heated air up from the exhaust manifold. When underhood temperature is below 90°F, the temperature control door blocks off underhood air from entering the air cleaner and allows only heated air from the exhaust manifold to be drawn into the air cleaner. When underhood temperature rises above 130°F, the temperature control door blocks off heated air from the exhaust manifold and allows only underhood air to be drawn into the air cleaner.

By controlling the temperature of the engine intake air this way, exhaust emissions are lowered and fuel economy is improved. In addition, throttle plate icing is reduced, and cold weather driveability is improved from the necessary leaner mixtures.

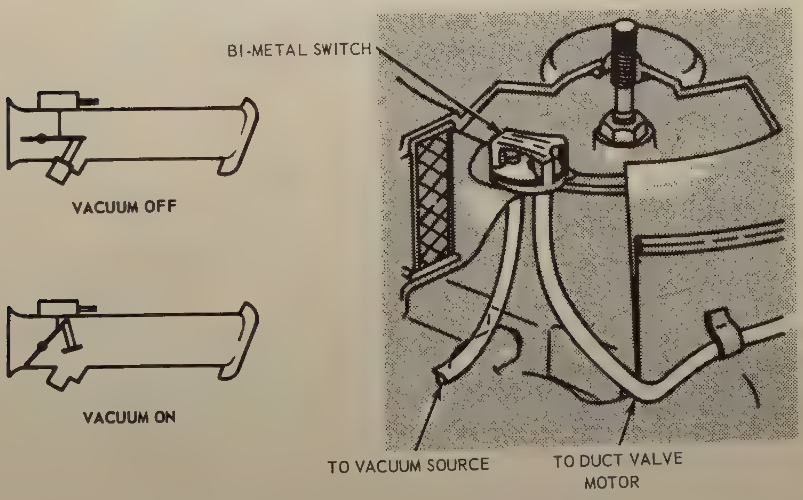
Dual Diaphragm Distributors

Dual diaphragm distributors are installed in most 1970–76 models. The best way to check for a dual diaphragm distributor is to count the number of vacuum hoses attached to the distributor vacuum chamber. One hose means you have a single diaphragm distributor, and two hoses denotes a dual diaphragm unit.

The dual distributor diaphragm is a two-chambered housing which is mounted on the side of the distributor. The outer side of the housing is a distributor vacuum ad-



Temperature-Operated Duct and Valve Assembly



Vacuum-Operated Duct and Valve Assembly

vance mechanism, connected to the carburetor by a vacuum hose. The purpose of the vacuum advance is to advance ignition timing according to the conditions under which the engine is operating. This device has been used on automobiles for many years now and its chief advantage is economical engine operation. The second side of the dual diaphragm is the side that has been added to help control engine exhaust emissions at idle and during deceleration.

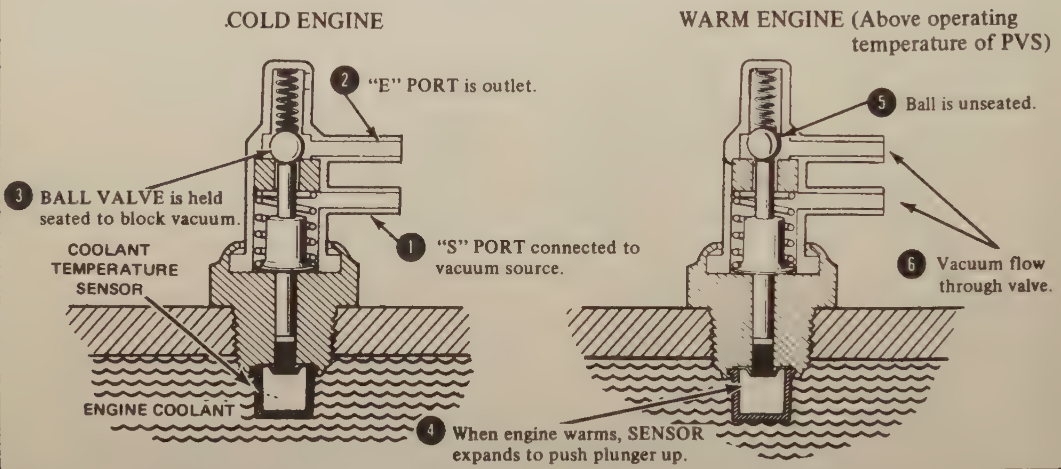
The inner side of the dual diaphragm is connected by a vacuum hose to the intake manifold. When the engine is idling or decelerating, intake manifold vacuum is high and carburetor vacuum is low. Under these conditions, intake manifold vacuum, applied to the inner side of the dual diaphragm, retards ignition timing to promote more complete combustion of the air fuel mixture in the engine combustion chambers.

Ported Vacuum Switch (Distributor Vacuum Control Valve)

Ported vacuum switches have been used in most 1970–76 models to switch vacuum

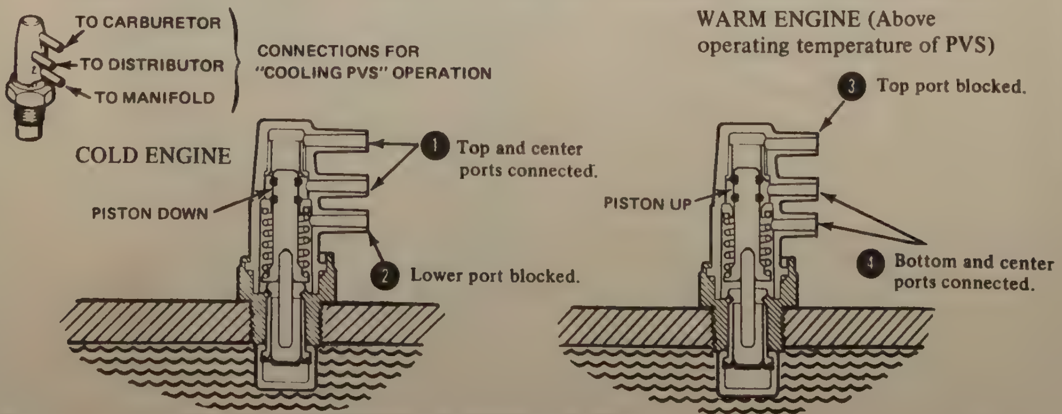
2-PORT PVS OPERATION

- Simple on-off "switch" for vacuum.
- **EGR-PVS valve** – cuts off EGR vacuum when engine is cold.

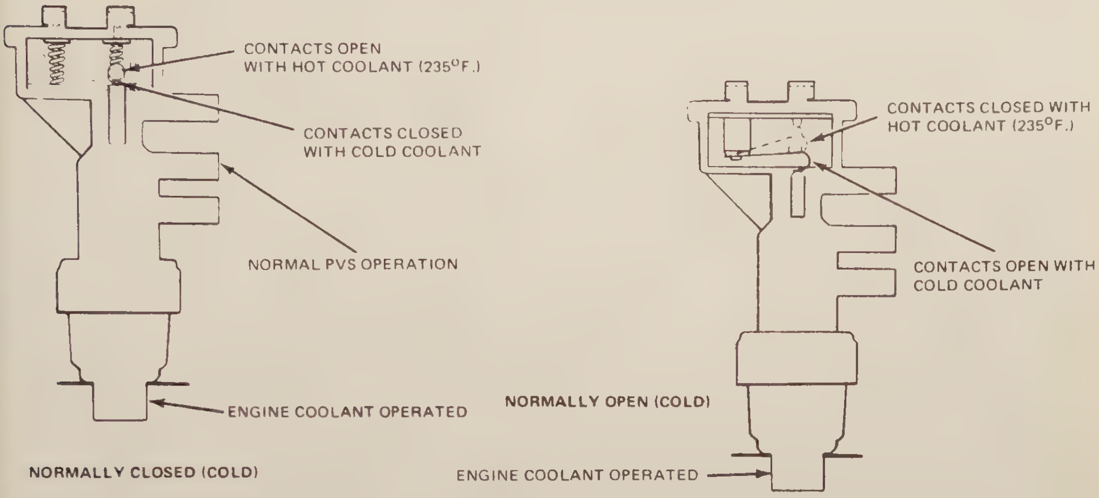

.COLD ENGINE
WARM ENGINE (Above operating temperature of PVS)
2 "E" PORT is outlet.
3 BALL VALVE is held seated to block vacuum.
COOLANT TEMPERATURE SENSOR
1 "S" PORT connected to vacuum source.
ENGINE COOLANT
5 Ball is unseated.
6 Vacuum flow through valve.
4 When engine warms, SENSOR expands to push plunger up.

3-PORT PVS OPERATION

- **EGR/CSC** – switches EGR vacuum from EGR system to distributor advance with cold engine.
- **Cold Start Spark Advance (CSSA)** – supplies manifold vacuum to distributor below 125° F. coolant temperature.
- **Coolant Spark Control (CSC)** – cuts off distributor advance below hot engine temperature.
- **Cooling PVS** – switches advance vacuum from spark port to manifold vacuum if engine overheats.

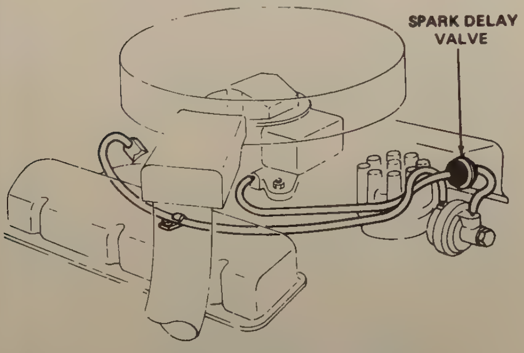

TO CARBURETOR
TO DISTRIBUTOR
TO MANIFOLD
CONNECTIONS FOR "COOLING PVS" OPERATION
WARM ENGINE (Above operating temperature of PVS)
3 Top port blocked.
COLD ENGINE
1 Top and center ports connected.
PISTON DOWN
2 Lower port blocked.
PISTON UP
4 Bottom and center ports connected.

Ported Vacuum Switch Operation


CONTACTS OPEN
WITH HOT COOLANT (235°F.)
CONTACTS CLOSED
WITH COLD COOLANT
NORMAL PVS OPERATION
ENGINE COOLANT OPERATED
NORMALLY CLOSED (COLD)
CONTACTS CLOSED WITH
HOT COOLANT (235°F.)
CONTACTS OPEN WITH
COLD COOLANT
NORMALLY OPEN (COLD)
ENGINE COOLANT OPERATED

Electric Ported Vacuum Switch Operation

signals with varying engine coolant temperatures. They may have two, three, or four vacuum ports, and, on 1975–76 models equipped with a catalytic converter and Thermactor air pump system, a set of electrical contacts. On some late model configurations, there may be as many as three or four separate ported vacuum switches, each with their own special function. PVS switches may be used to switch vacuum signals on an ignition spark control system to improve cold start driveability or lower emissions, to cut off exhaust gas recirculation until a predetermined engine coolant temperature is reached, to vent Thermactor air pump air to the atmosphere under certain engine conditions, to regulate a vacuum operated heat control valve in the exhaust manifold, or (especially on air conditioned cars), to provide extra ignition advance and subsequent higher idle speed should the engine begin to overheat.


SPARK DELAY
VALVE

Spark Delay Valve Installation (V8 shown)

Spark Delay Valve

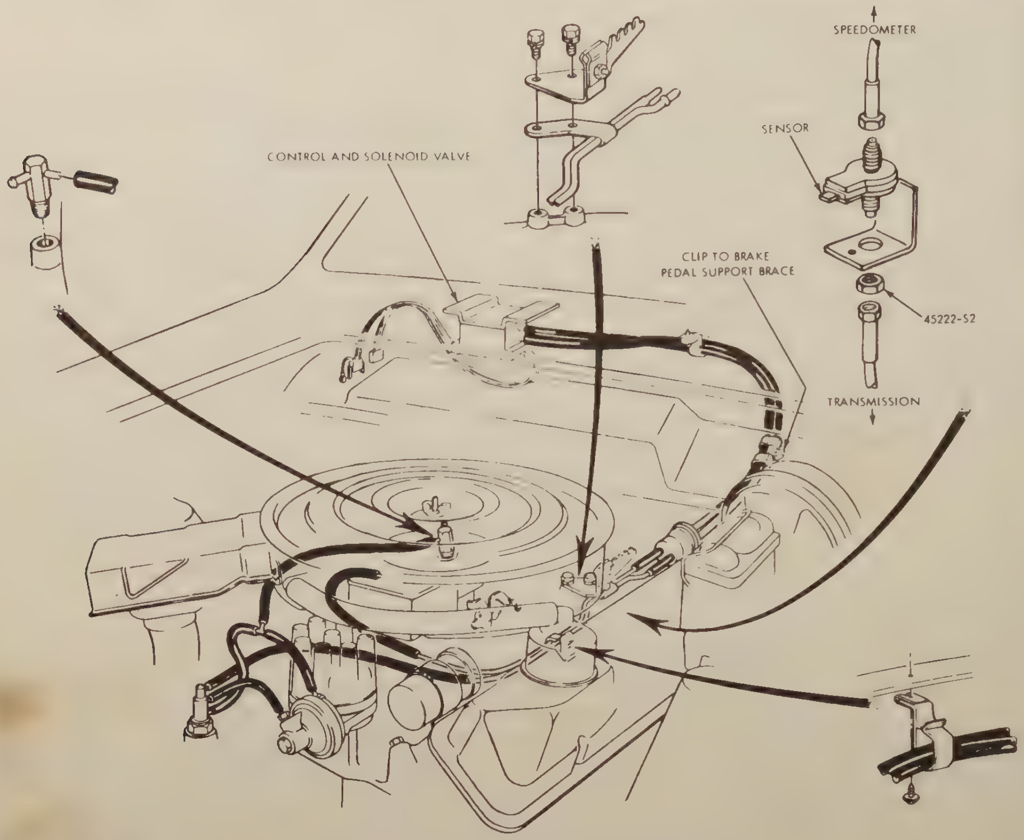
The spark delay valve is a plastic, spring-loaded, color coded valve which is installed in the vacuum line to the distributor advance diaphragm on many 1972–76 models. Under heavy throttle application, the valve will close, blocking normal carburetor vacuum to the distributor. After the designated period of closed time, the valve opens, restoring the carburetor vacuum to the distributor. The following chart illustrates the spark delay valve applications.

Spark Delay Valve

		Time in Seconds	
Color Code	*I.D. No.*	*Minimum*	*Maximum*
White/Brown	2	2	5
White/Green	20	9	20
Black and Grey	1	1	4
Black and Brown	2	2	5
Black and White	5	4	12
Black and Yellow	10	5.8	14
Black and Blue	15	7	16
Black and Green	20	9	20
Black and Orange	30	13	24
Black and Red	40	15	28

DISTRIBUTOR MODULATOR (DIST-O-VAC) SYSTEM

1971 Mavericks and Comets equipped with a 200 or 250 six-cylinder engine and automatic transmission are equipped with a Dist-O-Vac spark control system. This system is used in conjunction with all of the IMCO system equipment, except the



Typical Dist-O-Vac System Installation

deceleration valve which is no longer used.

The three components of the Dist-O-Vac system are the speed sensor, the thermal switch, and the electronic control module. The electronic control module consists of two sub-assemblies: the electronic control amplifier and the three-way solenoid valve.

The speed sensor, a small unit mounted in the speedometer cable, contains a rotating magnet and a stationary winding which is insulated from ground. The magnet, which rotates with the speedometer cable, generates a small voltage which increases directly with speed. This voltage is directed to the electronic control amplifier.

The thermal switch consists of a bimetallic-element switch which is mounted in the right door pillar and senses the temperature of the air. The switch is closed at 58°F or lower, and open at temperatures about 58°F. This switch is also connected to the electronic control amplifier.

Within the electronic control module case, there is a printed circuit board and an electronic amplifier. The speed sensor and thermal switch are connected to this assembly. The thermal switch is the dominant circuit. When the temperature of the outside air is 58°F or lower, the circuit is closed, so that regardless of speed, the electronic control amplifier will not trigger the three-way solenoid valve. At temperatures above 58°F, however, the thermal switch circuit is open, allowing the circuit from the speed sensor to take over and control the action of the solenoid valve.

The three-way solenoid valve is located within the electronic control module and below the printed circuit board of the amplifier. It is vented to the atmosphere at the top, and connected at the bottom to the carburetor spark port (small hose) and the primary (advance) side of the dual-diaphragm distributor (large hose). The large hose is also channeled through the temperature-sensing valve. The small hose is equipped with an air bleed to provide a positive air flow in the direction of the carburetor. The air bleed purges the hose of vacuum, thus assuring that raw gasoline will not be drawn through the hose and into the distributor diaphragm.

When the thermal switch is closed (air

temperature 58°F or lower), or when it is open and the speed sensor is not sending out a strong enough voltage signal (speeds below approximately 35 mph), the amplifier will not activate the solenoid valve and the valve is in the closed position, blocking the passage of air from the small tube through the large tube. With the valve in this position, the larger hose is vented to the atmosphere through the top opening in the three-way valve assembly. Consequently, no vacuum is being supplied to the primary diaphragm on the distributor, and, therefore, no vacuum advance.

When the air temperature is above 58°F and/or the speed of the car is sufficient to generate the required voltage (35 mph or faster), the valve opens, blocking the vent to the atmosphere while opening the vacuum line from the carburetor spark port to the primary diaphragm of the distributor.

ELECTRONIC SPARK CONTROL SYSTEM

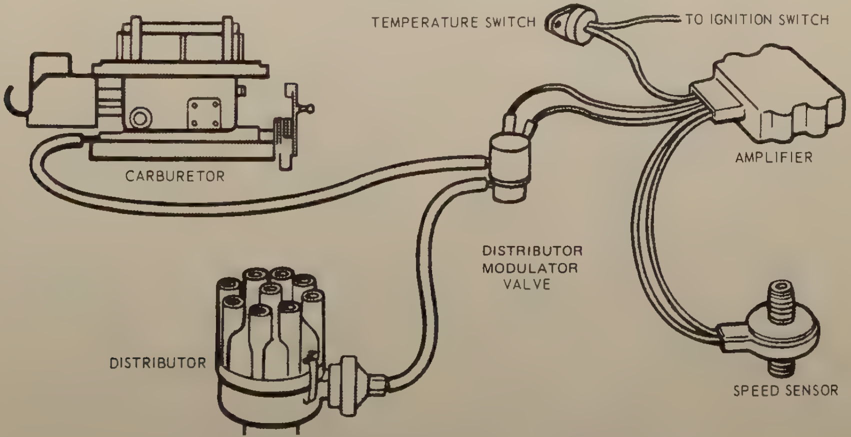
1972 Mavericks and Comets manufactured for sale in California equipped with a 302 V8 and automatic transmission, and all 200 six-cylinder models equipped with automatic transmission are equipped with an Electronic Spark Control System.

Electronic Spark Control is a system which blocks off carburetor vacuum to the distributor vacuum advance mechanism under certain temperature and speed conditions. The Electronic Spark Control System consists of four components: a temperature sensor, a speed sensor, an amplifier, and a distributor modulator vacuum valve. The system serves to prevent ignition timing advance (by blocking off carburetor vacuum from the distributor vacuum advance mechanism) until the car reaches a speed of 35 mph when the ambient temperature is over 65°F.

The temperature sensor, which is mounted on the front face of the right door pillar, monitors the outside air temperature and relays this information to the amplifier. The amplifier, which is located under the instrument panel, controls the distributor modulator vacuum valve. The modulator valve, which is attached to the ignition coil mounting bracket, is connected into the carburetor vacuum line to the distributor, and is normally open. If the temperature of the outside air is below 48°F, the contacts in the temperature sensor are open and no signal is sent to the amplifier. Since no signal is sent to the amplifier, the amplifier does not send a signal to the distributor modulator valve, and the vacuum passage from the carburetor to the distributor vacuum advance remains open. When the outside temperature rises to 65°F or above, the contacts in the temperature sensor close, and a signal is sent to the amplifier. The amplifier relays the message to the distributor modulator, which closes to block the vacuum passage to the distributor, preventing ignition timing advance.

When the ambient temperature is 65°F or above, ignition timing advance is prevented until the amplifier receives a signal from the speed sensor that the speed of the vehicle has reached 35 mph, and the distributor modulator vacuum valve can be opened to permit ignition timing advance.

The speed sensor is a miniature generator which is connected to the speedometer



Electronic Spark Control System Schematic cable of the car. As the speedometer cable turns, the inside of the speed sensor turns with the speedometer cable. As the speed of the car increases, a rotating magnet in the speed sensor induces an electronic current in the stationary windings in the speed sensor. This current is sent to the amplifier. As the speed of the vehicle increases, the amount of current sent to the amplifier by the speed sensor increases proportionately. When the car reaches a speed of 35 mph, the amplifier signals the distributor modulator vacuum valve to open, allowing carburetor vacuum to be sent to the distributor vacuum advance chamber. This permits the ignition timing to advance.

It should be noted that this system operates only when the ambient temperature is 65°F or above, and then only when the speed of the car is below 35 mph.

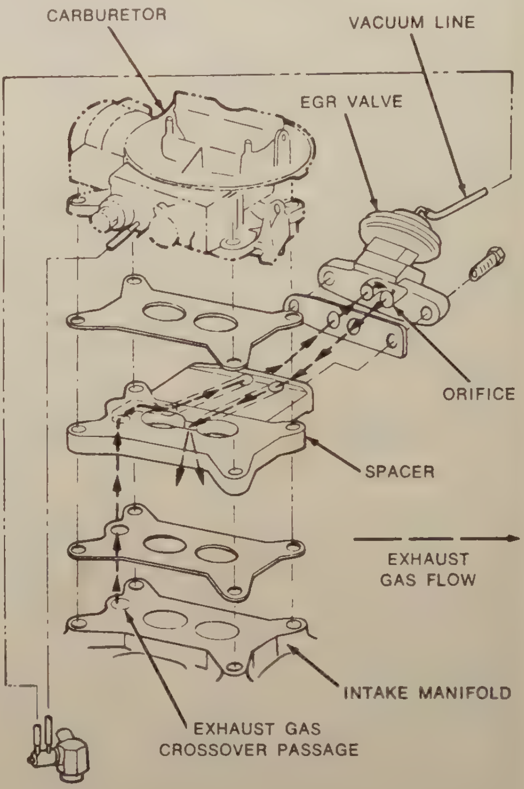
TRANSMISSION REGULATED SPARK SYSTEM

All 1972 Mavericks and Comets equipped with a 170 or 200 six-cylinder engine and manual transmission use a Transmission Regulated Spark Control System.

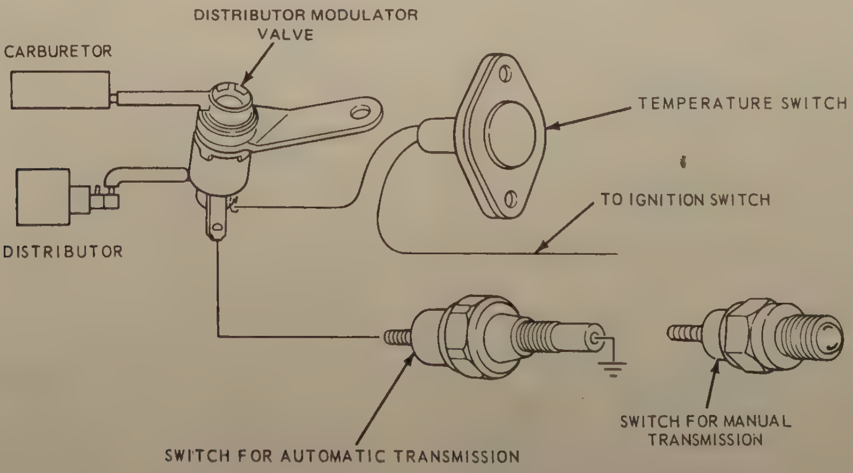
The Transmission Regulated Spark Control System (TRS) differs from the Dist-O-Vac and ESC systems in that the speed sensor and amplifier are replaced by a switch on the transmission. The switch is activated by a mechanical linkage which opens the switch when the transmission is shifted into High gear. The switch, when opened, triggers the opening of the vacuum lines to the distributor, thus providing vacuum advance. So, in short, the TRS system blocks vacuum advance to the distributor only when the outside temperature is above 65°F and the transmission is in First or Second gear.

EXHAUST GAS RECIRCULATION SYSTEM

All 1973 and later models are equipped with an Exhaust Gas Recirculation (EGR) system to control oxides of nitrogen.


CARBURETOR
VACUUM LINE
EGR VALVE
ORIFICE
SPACER
EXHAUST GAS FLOW
INTAKE MANIFOLD
EXHAUST GAS CROSSOVER PASSAGE

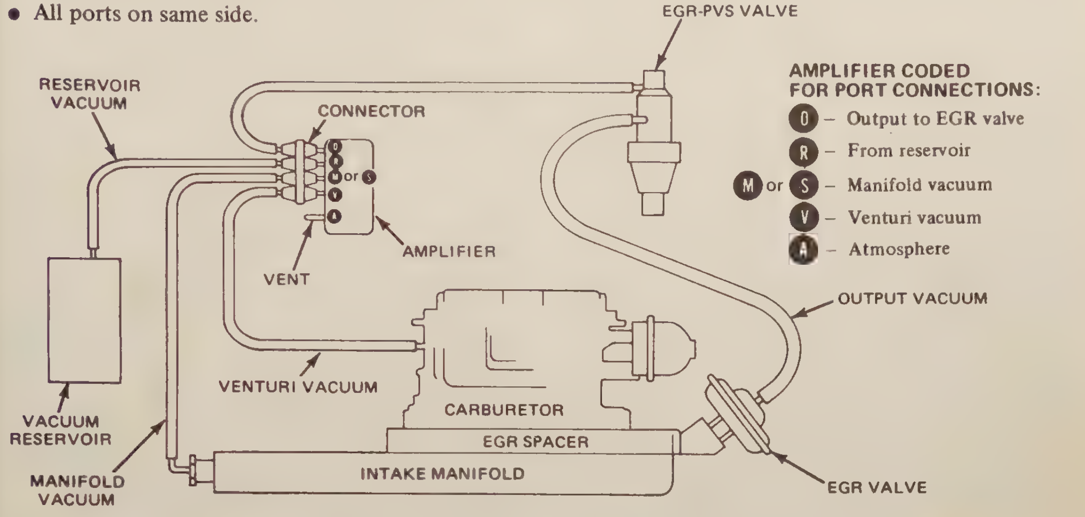
Routing of Exhaust Gases on 1973–76 302 V8


DISTRIBUTOR MODULATOR VALVE
CARBURETOR
TEMPERATURE SWITCH
TO IGNITION SWITCH
DISTRIBUTOR
SWITCH FOR MANUAL TRANSMISSION
SWITCH FOR AUTOMATIC TRANSMISSION

Transmission Regulated Spark Control System Schematic

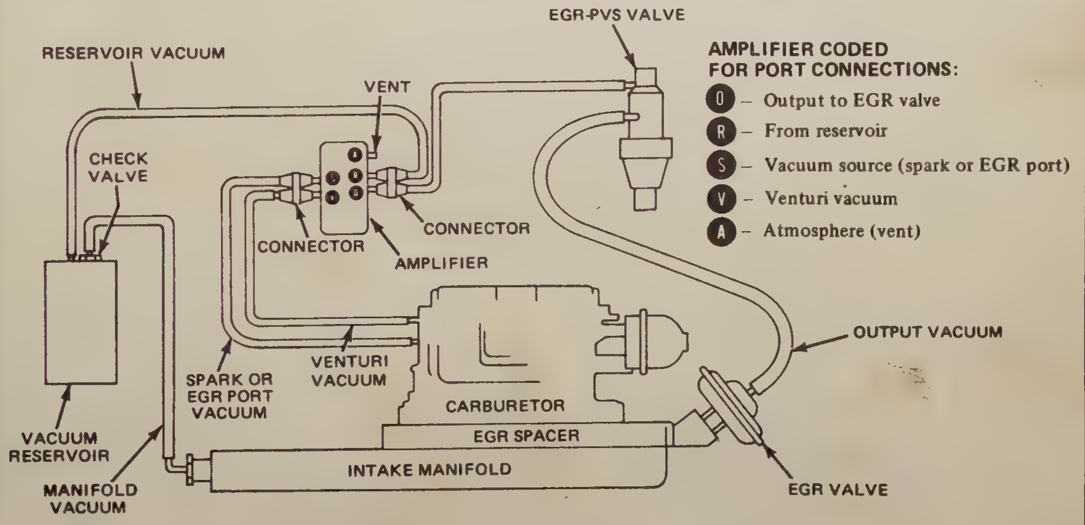
SINGLE-CONNECTOR VENTURI VACUUM AMPLIFIER – TYPICAL

- Single-connector design (1974 and 1975).
- All ports on same side.


EGR-PVS VALVE
AMPLIFIER CODED FOR PORT CONNECTIONS:
O – Output to EGR valve
R – From reservoir
M or S – Manifold vacuum
V – Venturi vacuum
A – Atmosphere
RESERVOIR VACUUM
CONNECTOR
O
R
M or S
V
A
AMPLIFIER
VENT
OUTPUT VACUUM
VENTURI VACUUM
CARBURETOR
VACUUM RESERVOIR
EGR SPACER
MANIFOLD VACUUM
INTAKE MANIFOLD
EGR VALVE

DUAL-CONNECTOR VENTURI VACUUM AMPLIFIER – TYPICAL

- Dual-connector design (new for 1975).
- Ports on both sides (front and back).
- Three types – Marvel-Schebler, Fram and Ranco.


EGR-PVS VALVE
RESERVOIR VACUUM
AMPLIFIER CODED FOR PORT CONNECTIONS:
O – Output to EGR valve
R – From reservoir
S – Vacuum source (spark or EGR port)
V – Venturi vacuum
A – Atmosphere (vent)
VENT
CHECK VALVE
CONNECTOR
CONNECTOR
AMPLIFIER
OUTPUT VACUUM
VENTURI VACUUM
SPARK OR EGR PORT VACUUM
CARBURETOR
VACUUM RESERVOIR
EGR SPACER
MANIFOLD VACUUM
INTAKE MANIFOLD
EGR VALVE

EGR Venturi Vacuum Amplifier Systems—1974–76

On V8 engines, exhaust gases travel through the exhaust gas crossover passage in the intake manifold. A portion of these gases are diverted into a spacer which is mounted under the carburetor. The EGR control valve, which is attached to the rear of the spacer, consists of a vacuum diaphragm with an attached plunger which normally block off exhaust gases from entering the intake manifold. On 6 cylinder engine, an external tube carries exhaust manifold gases to the carburetor spacer. On all models, the EGR Valve is controlled by a vacuum line from the carburetor which passes through a ported vacuum switch. The EGR ported vacuum switch provides vacuum to the EGR valve at coolant temperature above 125°F. The vacuum diaphragm then opens the EGR valve permitting exhaust gases to flow through the carburetor spacer and enter the intake manifold where they combine with the fuel mixture and enter the combustion chambers. The exhaust gases are relatively oxygen-free, and tend to dilute the combustion charge. This lowers peak combustion temperature thereby reducing oxides of nitrogen.

EGR System Venturi Vacuum Amplifier

On all 1974 California models, and most 1975–76 50 states models, the EGR system has been modified to include a venturi vacuum amplifier. The amplifier is used to boost a relatively weak venturi vacuum signal in the throat of the carburetor into a strong intake manifold vacuum signal to operate the EGR valve. This device improves driveability by more closely matching venturi air flow and EGR flow.

The amplifier features a vacuum reservoir and check valve to maintain an adequate vacuum supply regardless of variations in engine manifold vacuum. Also used in conjunction with the amplifier, is a relief valve, which will cancel the output EGR vacuum signal whenever the venturi vacuum signal is equal to, or greater than, the intake manifold vacuum. Thus, the EGR valve may close at or near wide-open throttle acceleration, when maximum power is needed.

EGR/COOLANT SPARK CONTROL (CSC) SYSTEM

The EGR/CSC system is used on most 1974 and later models. It regulates both distributor spark advance and the EGR valve operation according to coolant temperature by sequentially switching vacuum signals.

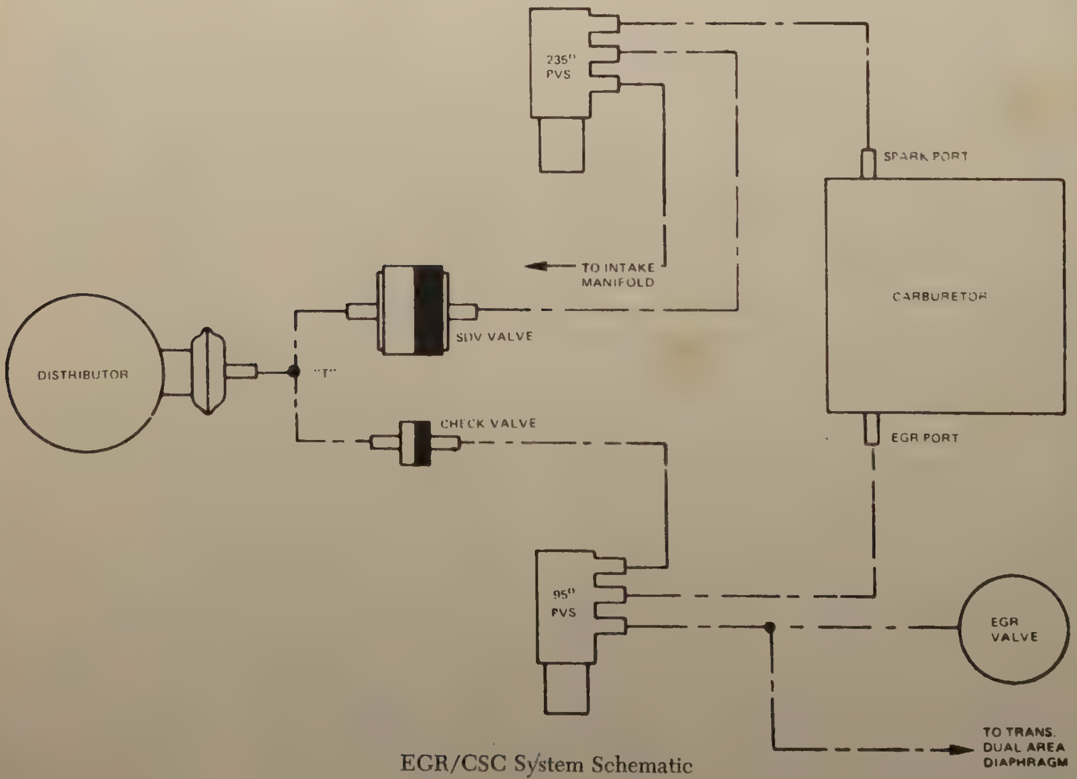
The major EGR/CSC system components are:

1. 95° F EGR-PVS valve;
2. Spark Delay Valve (SDV);
3. Vacuum check valve.

When the engine coolant temperature is below 82° F, the EGR-PVS valve admits carburetor EGR port vacuum (occurring at about 2,500 rpm) directly to the distributor advance diaphragm, through the one-way check valve.

At the same time, the EGR-PVS valve shuts off carburetor EGR vacuum to the EGR valve and transmission diaphragm.

When engine coolant temperature is 95° F and above, the EGR-PVS valve is actuated and directs carburetor EGR vacuum to the EGR valve and transmission instead of the distributor. At temperatures between 82–95° F, the EGR-PVS



EGR/CSC System Schematic

valve may be open, closed, or in mid-position.

The SDV valve delays carburetor spark vacuum to the distributor advance diaphragm by restricting the vacuum signal through the SDV valve for a predetermined time. During normal acceleration, little or no vacuum is admitted to the distributor advance diaphragm until acceleration is completed, because of (1) the time delay of the SDV valve and (2) the re-routing of EGR port vacuum if the engine coolant temperature is 95° F or higher.

The check valve blocks off vacuum signal from the SDV to the EGR-PVS so that carburetor spark vacuum will not be dissipated when the EGR-PVS is actuated above 95° F.

TEMPERATURE ACTIVATED VACUUM (TAV) SYSTEM

1973 Mavericks and Comets using the 250 six-cylinder engine and automatic transmission built before March 15, 1973 are equipped with a Temperature Activated Vacuum (TAV) system to control distributor spark advance. The system contains a 3-way solenoid valve, an ambient temperature switch located in the front door hinge pillar, a vacuum bleed line to the carburetor airhorn and a spark delay valve.

When the ambient temperature is above 60°F, the contacts in the temperature sensor close and complete the circuit to the 3-way solenoid. This energizes the solenoid and connects the EGR vacuum port on the carburetor to the distributor vacuum advance. The EGR vacuum signal is weaker than the normal spark port vacuum signal, thus supplying less vacuum advance once the outside temperature rises above 60°F. When the ambient temperature is below 49°F, the solenoid is de-energized and the distributor vacuum advance operates in the normal manner, thus aiding cold weather driveability.

COLD TEMPERATURE ACTIVATED VACUUM (CTAV) SYSTEM

1973 Mavericks and Comets using the 250 six-cylinder engine and automatic transmission built on or after March 15, 1973, as well as all 1974–76 models using the 250 six and automatic transmission are equipped with a Cold Temperature Activated Vacuum (CTAV) system to control distributor spark advance. This system is basically a refinement of the TAV system with the temperature switch relocated in the air cleaner and a latching relay added to maintain a strong vacuum signal at the distributor, whether it be EGR port or spark port carburetor vacuum, and to keep the system from intermittently switching vacuum signals when the intake air is between 49 and 60°F. When the temperature switch closes at 60°F, the latching relay (normally off) is energized and stays on until the ignition switch is turned off. The latching relay then overrides the temperature switch and forces the solenoid valve to keep the spark port vacuum system closed and open the EGR port vacuum system. This prevents full vacuum advance, once the engine is warmed-up, thereby lowering emissions.

THERMACTOR SYSTEM

1974 California models, as well as all 1975–76 50 states models are equipped with a Thermactor emission control system. This system is used in addition to the existing PCV, fuel evaporative, IMCO, EGR, and catalytic converter control systems.

The Thermactor emission control system makes use of a belt-driven air pump to inject fresh air into the hot exhaust stream through the engine exhaust ports. The result is the extended burning of those fumes which were not completely ignited in the combustion chamber, and the subsequent reduction of some of the hydrocarbon and carbon monoxide content of the exhaust emissions into harmless carbon dioxide and water.

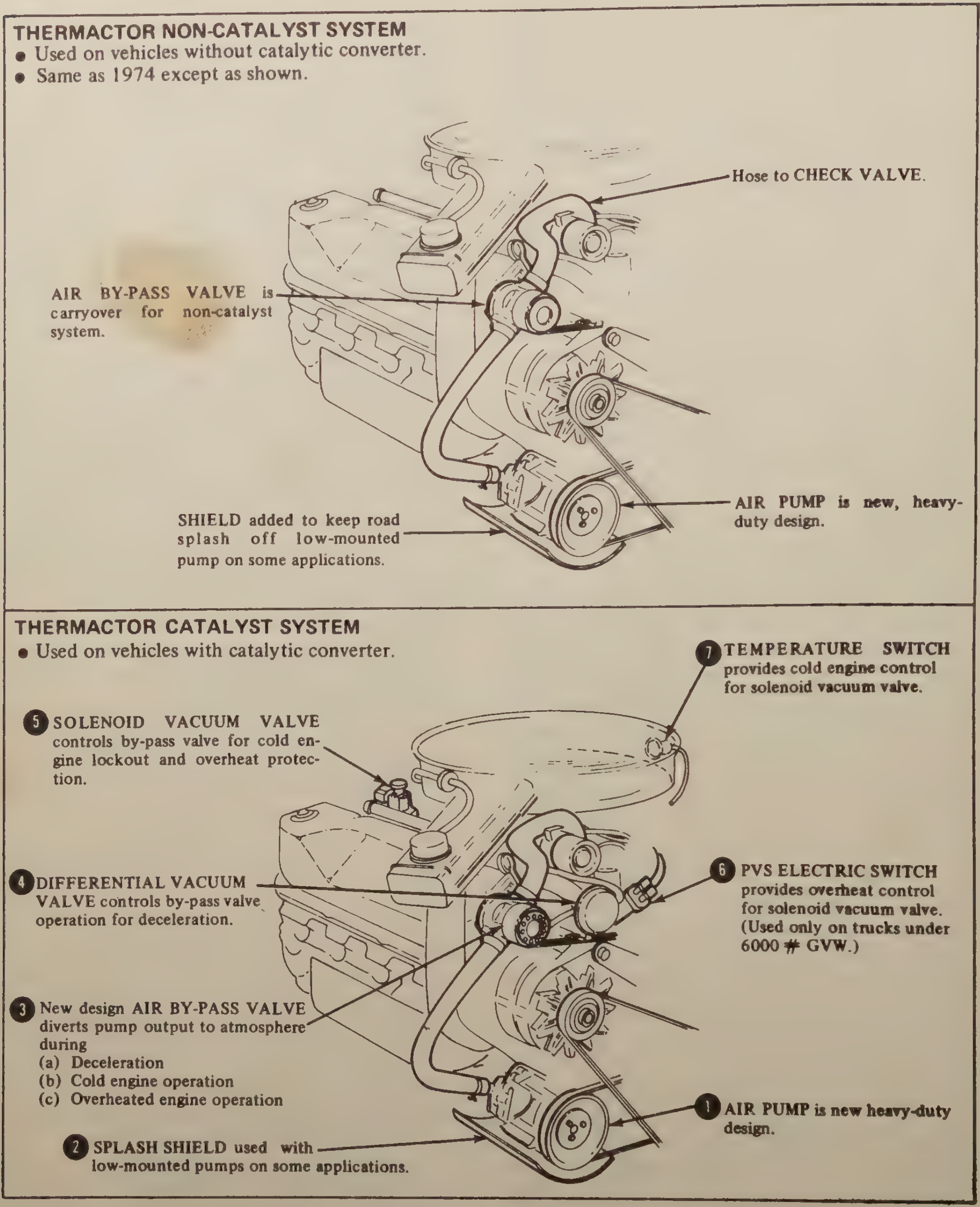
The 1974 Thermactor system is composed of the following components:

1. Air supply pump (belt-driven)
2. Air by-pass valve
3. Check valves
4. Air manifolds (internal or external)
5. Air supply tubes (on external manifolds only).

Air for the Thermactor system is cleaned by means of a centrifugal filter fan mounted on the air pump driveshaft. The air filter does not require a replaceable element.

To prevent excessive pressure, the air pump is equipped with a pressure relief valve which uses a replaceable plastic plug to control the pressure setting.

The Thermactor air pump has sealed



THERMACTOR NON-CATALYST SYSTEM

- Used on vehicles without catalytic converter.
- Same as 1974 except as shown.

Hose to CHECK VALVE.

AIR BY-PASS VALVE is carryover for non-catalyst system.

AIR PUMP is new, heavy-duty design.

SHIELD added to keep road splash off low-mounted pump on some applications.

THERMACTOR CATALYST SYSTEM

- Used on vehicles with catalytic converter.

⑦ TEMPERATURE SWITCH provides cold engine control for solenoid vacuum valve.

⑤ SOLENOID VACUUM VALVE controls by-pass valve for cold engine lockout and overheat protection.

⑥ PVS ELECTRIC SWITCH provides overheat control for solenoid vacuum valve. (Used only on trucks under 6000 # GVW.)

④ DIFFERENTIAL VACUUM VALVE controls by-pass valve operation for deceleration.

③ New design AIR BY-PASS VALVE diverts pump output to atmosphere during
(a) Deceleration
(b) Cold engine operation
(c) Overheated engine operation

① AIR PUMP is new heavy-duty design.

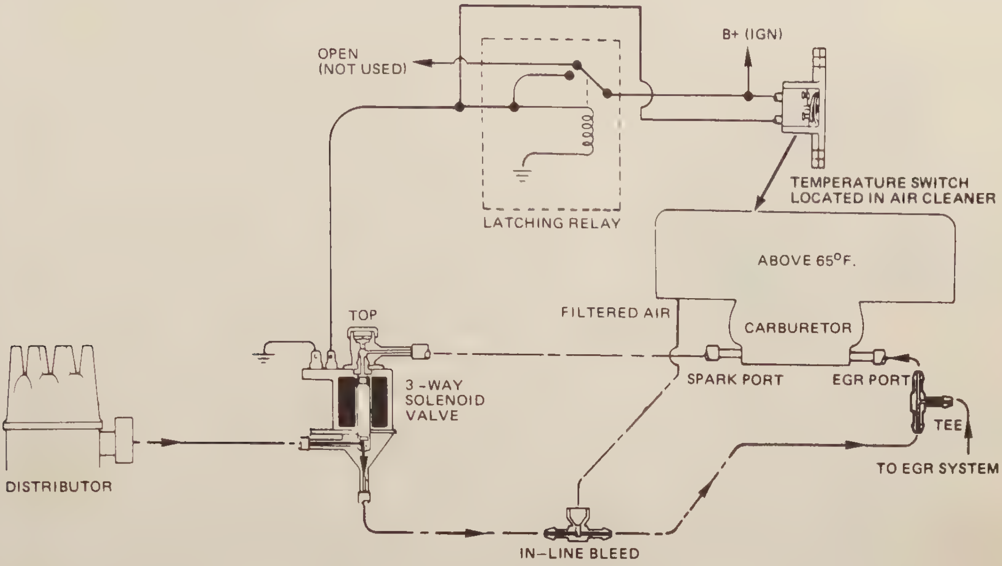
② SPLASH SHIELD used with low-mounted pumps on some applications.

1975–76 Thermactor Systems

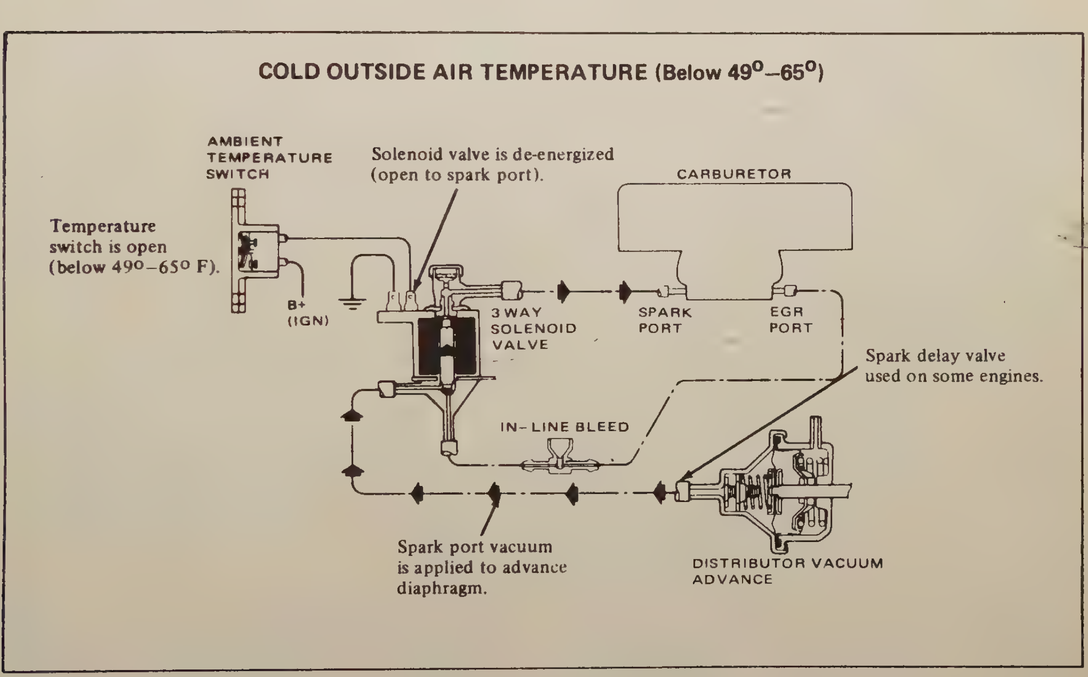
bearings which are lubricataed for the life of the unit, and pre-set rotor vane and bearing clearances, which do not require any periodic adjustments.

The air supply from the pump is controlled by the air by-pass valve, sometimes called a dump valve. During deceleration, the air by-pass valve opens, momentarily diverting the air supply through a silencer and into the atmosphere, thus preventing backfires within the exhaust system.

A check valve is incorporated in the air inlet side of the air manifolds. Its purpose is to prevent exhaust gases from backing up into the Thermactor system. This valve is especially important in the event of


OPEN
(NOT USED)
B+ (IGN)
LATCHING RELAY
TEMPERATURE SWITCH
LOCATED IN AIR CLEANER
ABOVE 65°F.
FILTERED AIR
CARBURETOR
TOP
SPARK PORT
EGR PORT
3-WAY
SOLENOID
VALVE
TEE
TO EGR SYSTEM
DISTRIBUTOR
IN-LINE BLEED

CTAV System Schematic above 65° F

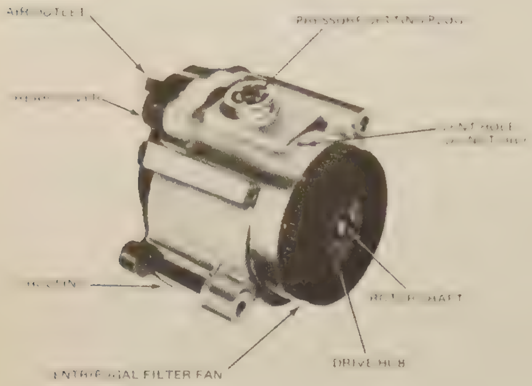

COLD OUTSIDE AIR TEMPERATURE (Below 49°–65°)
AMBIENT
TEMPERATURE
SWITCH
Solenoid valve is de-energized
(open to spark port).
CARBURETOR
Temperature
switch is open
(below 49°–65° F).
B+
(IGN)
3 WAY
SOLENOID
VALVE
SPARK
PORT
EGR
PORT
Spark delay valve
used on some engines.
IN-LINE BLEED
Spark port vacuum
is applied to advance
diaphragm.
DISTRIBUTOR VACUUM
ADVANCE

TAV System Schematic

drive belt failure, and during deceleration, when the air by-pass valve is dumping the air supply.

The air manifolds and air supply tubes channel the air from the Thermactor air pump into the exhaust ports of each cylinder, thus completing the cycle of the Thermactor system.

The Thermactor system used on 1975–76 cars with catalytic converters incorporates several components to prevent excessive converter temperatures from developing. Since the catalyst requires large quantities of oxygen to function, an air by-pass valve and a vacuum differential (VDV) valve are used to control temperatures by dump-



Air Supply Pump—1974 type shown; 1975–76 pump similar

ing air from the Thermactor pump to the atmosphere instead of delivering it to the catalyst.

The purpose of these valves is to "dump" air during periods of vacuum failure, the rich exhaust gas condition during deceleration, prevent backfire when the exhaust gases are overly rich, and provide pressure relief (due to excessive air pump volume or restriction downstream).

The air by-pass valve used with catalytic converters differs from the valve used on cars without converters, and can be identified by the *vacuum port on top of the valve*. The valve functions as follows:

During normal operation, engine intake manifold vacuum applied through the VDV holds the valve upward, allowing thermactor air to flow to the cylinder head(s) and blocking the vent port. When engine intake manifold vacuum rises or drops sharply (such as during acceleration or deceleration, or system blockage or failure), the VDV operates and momentarily cuts off the vacuum to the by-pass valve. The spring pulls the stem down, seating the valve to cut off pump air to the exhaust manifold, and opening the dump valve at the lower end of the by-pass valve to momentarily divert the pump air to the atmosphere. In the case of excess pump volume or a downstream restriction, the excess pressure will unseat the valve in the lower portion of the by-pass valve and allow a partial flow of pump air to the atmosphere. At the same time, the valve in the upper part of the by-pass is still unseated, allowing a partial flow of pump air to the exhaust manifold to meet system requirements.

The vacuum differential valve (VDV) controls the operation of the new by-pass valve used with catalytic converter equipped systems.

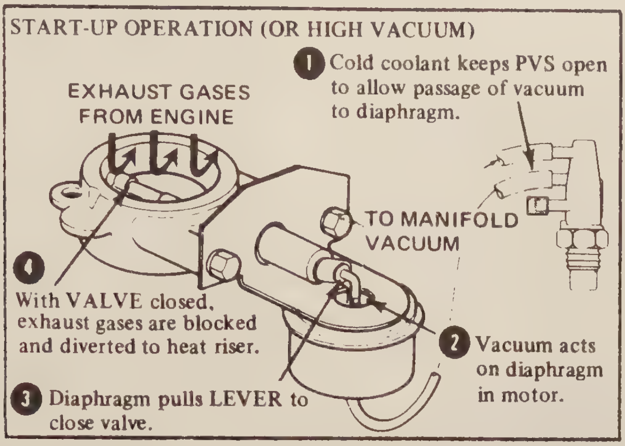
The VDV is inserted in the vacuum control line to the by-pass valve and serves to cut off the vacuum and de-energize the by-pass valve. The differential valve consists of a diaphragm connected to a dump valve that controls the vacuum to the by-pass valve. During normal operation, vacuum is equalized on both sides of the diaphragm and the spring holds the dump valve closed. When sudden higher than normal vacuum is encountered, such as under deceleration conditions, vacuum is higher on the dump valve side of the diaphragm and the diaphragm operates the dump valve. As the dump valve operates, the vacuum signal to the by-pass valve is diverted through the built-in filter system to atmosphere. When the vacuum bleeding through the by-pass timing orifice in the VDV has equalized on both sides of the diaphragm, the diaphragm return spring once again closes the dump valve and applies vacuum to the by-pass valve, which again applies pump air to the exhaust ports.

VACUUM OPERATED HEAT CONTROL VALVE (VOHV)

To further aid cold start driveability during engine warmup, 1975–76 V8 engines use a VOHV located between the exhaust manifold and the exhaust inlet (header) pipe.

When the engine is first started, the valve is closed, blocking exhaust gases from exiting from one bank of cylinders. These gases are then diverted back through the intake manifold crossover passage under the carburetor. The result is quick heat to the carburetor and choke.

The VOHV is controlled by a ported vacuum switch which uses manifold vacuum to keep the vacuum motor on the valve closed until the coolant reaches a predetermined "warm-up" valve. When the engine is warmed-up, the PVS shuts off vacuum to the VOHV, and a strong return spring opens the VOHV butterfly.


START-UP OPERATION (OR HIGH VACUUM)
EXHAUST GASES FROM ENGINE
① Cold coolant keeps PVS open to allow passage of vacuum to diaphragm.
TO MANIFOLD VACUUM
④ With VALVE closed, exhaust gases are blocked and diverted to heat riser.
② Vacuum acts on diaphragm in motor.
③ Diaphragm pulls LEVER to close valve.

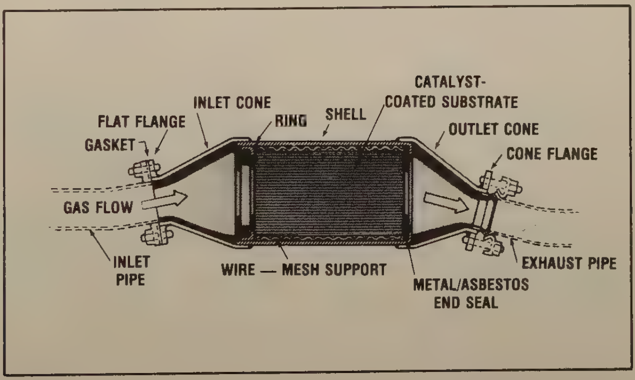
Vacuum Operated Exhaust Heat Control Valve System Operation

CATALYTIC CONVERTER SYSTEM

Beginning in 1975, catalytic converters are used to clean up carbon monoxide and hydrocarbon emissions after they leave the engine. The use of a single converter, located in the exhaust system between the engine and muffler, allows the engine to be tuned with more ignition advance, permitting better driveability, gas mileage, and performance. In 1975, Ford planned to use the converters only on California models using the 250 Six and 302 V8, and on the 49 states version of the 200 Six. However, a mid-year economy and driveability program saw the installation of the converters on all 1975 models nationwide. So, your 1975 49 states 250 Six or 302 V8 model may or may not have a converter. The engine emission equipment decal, located on the valve cover of the engine, will give you a definitive answer. All 1976 models have the converter.

The catalyst agent inside each converter consists of platinum or palladium crystallites spread over a ceramic honeycomb substrate. The surface area exposed to the exhaust gases is roughly equivalent to that of a football field. Unlike the Thermactor system, no actual combustion takes place inside the converter. Instead, the catalyst triggers a rapid oxidation (chemical change), of the pollutants into water vapor and sulphur dioxide. The sulphur dioxide is the occasional "rotten egg" smell that you will notice on a humid day, or if the car is running overly rich.

If the car is kept in proper tune, and if only lead-free fuel is used, the converter is designed to last a minimum of 50,000 miles before needing replacement.

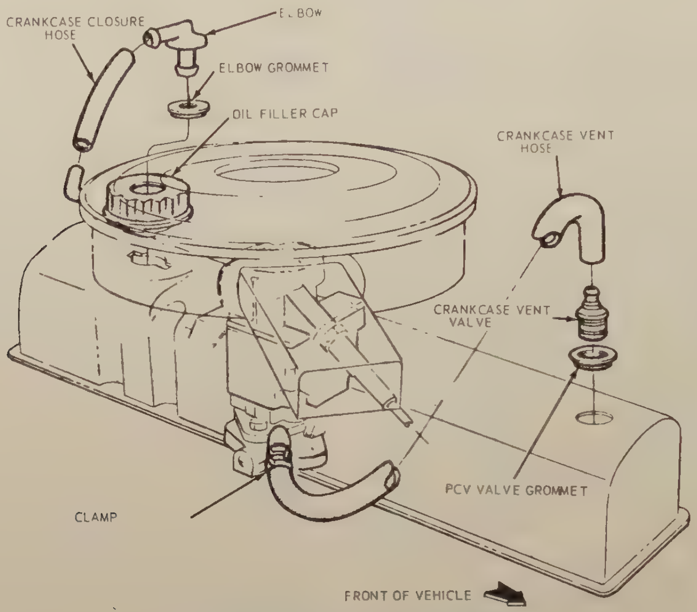

CATALYST-COATED SUBSTRATE
INLET CONE
FLAT FLANGE
RING
SHELL
OUTLET CONE
GASKET
CONE FLANGE
GAS FLOW
INLET PIPE
WIRE — MESH SUPPORT
METAL/ASBESTOS END SEAL
EXHAUST PIPE

Typical Catalytic Converter Cross-Section—Unitized Body Cars

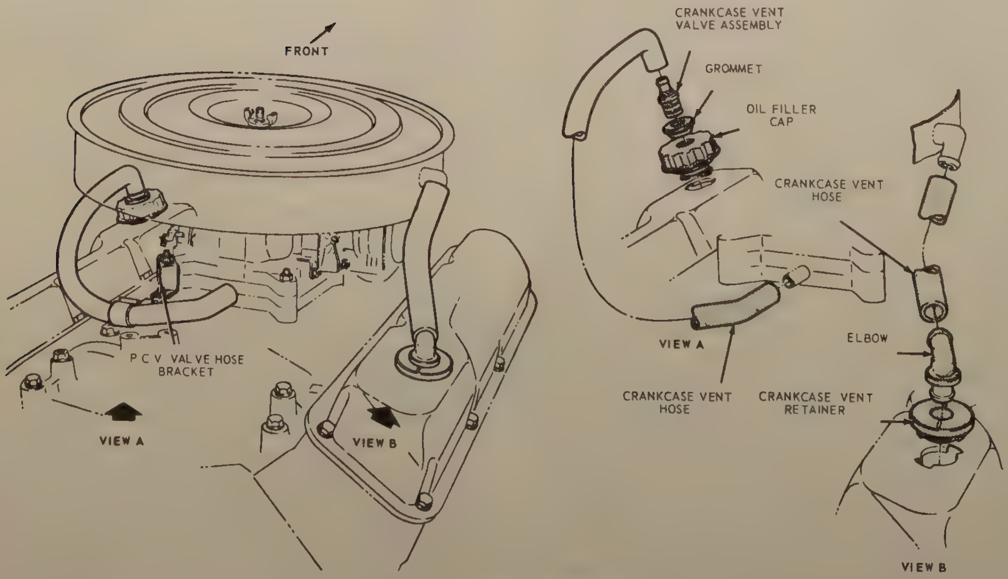
COMPONENT SERVICE

Positive Crankcase Ventilation System

1. Remove the PCV system components, filler cap, PCV valve, hoses, tubes, fittings, etc. from the engine.
2. Soak the rubber ventilation hose(s) in a low volatility petroleum base solvent.
3. Clean the rubber ventilation hose(s) by passing a suitable cleaning brush through them.
4. Thoroughly wash the rubber hoses in a low volatility petroleum base solvent and dry with compressed air.
5. Thoroughly wash the crankcase breather cap, if so equipped, in a low volatility petroleum base solvent and shake dry. Do not dry with compressed air; damage to the filtering media may result.
6. Thoroughly clean tubes, fittings, connections to assure unobstructed flow of emission gases.


CRANKCASE CLOSURE HOSE
ELBOW
ELBOW GROMMET
OIL FILLER CAP
CRANKCASE VENT HOSE
CRANKCASE VENT VALVE
CLAMP
PCV VALVE GROMMET
FRONT OF VEHICLE

Six-Cylinder PCV System Components


FRONT
P C V VALVE HOSE BRACKET
VIEW A
VIEW B
CRANKCASE VENT VALVE ASSEMBLY
GROMMET
OIL FILLER CAP
CRANKCASE VENT HOSE
VIEW A
ELBOW
CRANKCASE VENT HOSE
CRANKCASE VENT RETAINER
VIEW B

V8 PCV System Components

7. Install new PCV valve and re-install previously removed hoses, tubes, fittings, etc. to their proper location.

8. Replace any system component that shows signs of damage, wear or deterioration as required.

9. Replace any hose or tube that cannot be cleaned satisfactorily.

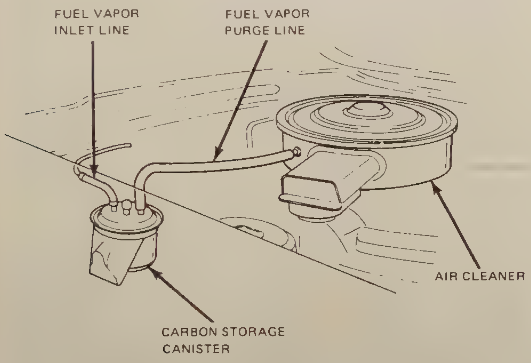
Fuel Evaporative Control System

Except for 1970 Mavericks manufactured for sale in California, the only service performed on the evaporative control system is the replacement of the charcoal (carbon) canister at the intervals listed in the maintenance schedule in Chapter 1. The above mentioned California registered 1970 Mavericks require replacement of the 3-way vent valve once a year or every 12,000 miles. The procedure is as follows.

1. Working under the vehicle, disconnect two hoses from the control valve.

2. Remove two attaching bolts and remove the valve from the frame members.

3. To install, position the valve to the frame member and install two attaching bolts.



Charcoal (Carbon) Canister Location

4. Connect the two hoses to the valve assembly.

Exhaust Gas Recirculation System

NOTE: *1975–76 models using unleaded fuel do not require regular EGR system cleaning.*

EGR Valve Cleaning

Remove the EGR valve for cleaning. Do not strike or pry on the valve diaphragm housing or supports, as this may damage the valve operating mechanism and/or change the valve calibration. Check orifice hole in the EGR valve body for deposits. A small hand drill of no more than 0.060 in. diameter may be used to clean the hole if plugged. Extreme care must be taken to avoid enlarging the hole or damaging the surface of the orifice plate.

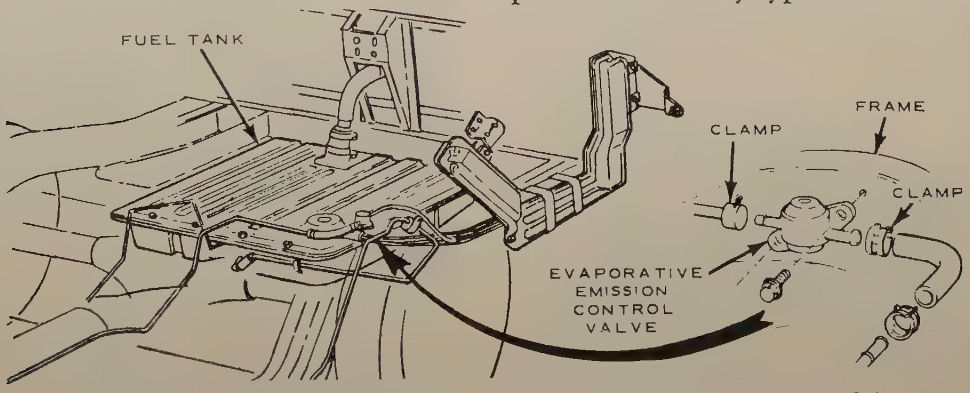
Cleaning EGR Valve Orifice

Valves Which Cannot Be Disassembled

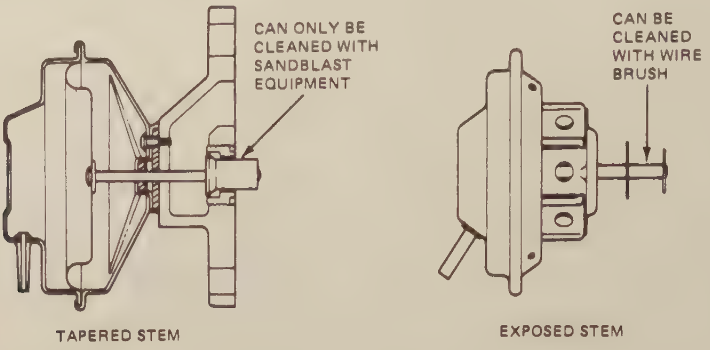
Valves which are riveted or otherwise permanently assembled should be replaced if highly contaminated; they cannot be cleaned.

Valves Which Can Be Disassembled

Separate the diaphragm section from the main mounting body. Clean the valve plates, stem, and the mounting plate, using a small power driven rotary type wire brush. Take



Evaporative Control 3-Way Vent Valve Location (1970 California models only)


CAN ONLY BE CLEANED WITH SANDBLAST EQUIPMENT
CAN BE CLEANED WITH WIRE BRUSH
TAPERED STEM
EXPOSED STEM

EGR Valve Comparison

care not to damage the parts. Remove deposits between stem and valve disc by using a steel blade or shim approximately 0.028 inch thick in a sawing motion around the stem shoulder at both sides of the disc.

The poppet must wobble and move axially before re-assembly.

Clean the cavity and passages in the main body of the valve with a power driven rotary wire brush. If the orifice plate has a hole less than 0.450 inch, it must be removed for cleaning. Remove all loosened debris using shop compressed air. Reassemble the diaphragm section on the main body using a new gasket between them. Torque the attaching screws to specification. Clean the orifice plate and the counterbore in the valve body. Re-install the orifice plate using a small amount of contact cement to retain the plate in place during assembly of the valve to the carburetor spacer. Apply cement only to outer edges of the orifice plate to avoid restriction of the orifice.

EGR Supply Passages and Carburetor Spacer Cleaning

Remove the carburetor and carburetor spacer on engines so equipped. Clean the supply tube with a small power driven rotary type wire brush or blast cleaning equipment. Clean the exhaust gas passages in the spacer using a suitable wire brush and/or scraper. The machined holes in the spacer can be cleaned by using a suitable round wire brush. Hard encrusted material should be probed loose first, then brushed out. On six-cylinder engines, the external tube from the exhaust manifold must be removed and cleaned with a brush.

Cleaning EGR Carburetor Spacer Exhaust Passages

Cleaning EGR Carburetor Spacer Machined Holes

External Exhaust Gas Supply Tube—Six-Cylinder Engines

EGR Exhaust Gas Channel Cleaning

Clean the exhaust gas channel, where applicable, in the intake manifold, using a suitable carbon scraper. Clean the ex-

Cleaning EGR Exhaust Gas Entry Port in Intake Manifold

haust gas entry port in the intake manifold by hand passing a suitable drill bit thru the holes to auger out the deposits. Do not use a wire brush. The manifold riser bore(s) should be suitably plugged during the above action to prevent any of the residue from entering the induction system.

Thermactor Air Pump Drive Belt Replacement and/or Adjustment

1. Loosen the air pump adjusting bolt. Loosen the air pump-to-mounting bracket bolt and push the air pump toward the cylinder block. Remove the belt.

2. Install a new drive belt. With a suitable bar, pry against the rear cover of the air pump to obtain the specified belt tension.

3. Retighten the pump mounting bolts. NOTE: *It is highly advisable to use a belt tension gauge (T63L-8620-A) to check belt tension. When using this tool, follow the manufacturer's instructions and specifications. Any belt which has been operated for 10 minutes or more is considered to be a "used" belt, and should be adjusted accordingly.*

In the event that a belt tension gauge is not available, the thumb deflection method of belt tension adjustment must be employed. This method is discussed in Chapter 1.

COMPONENT TESTING

Positive Crankcase Ventilation System

PCV VALVE TEST

1. See if any deposits are present in the carburetor passages, the oil filler cap, or the hoses. Clean these as required.

2. Connect a tachometer, as instructed by its manufacturer, to the engine.

3. With the engine idling, do one of the following:

   a. Remove the PCV valve hose from the crankcase or the oil filter connection.

   b. On cars with the PCV valve located in a grommet on the valve cover, remove both the valve and the grommet.

   NOTE: *If the valve and the hoses are not clogged-up, a hissing sound should be present.*

4. Check the tachometer reading. Place a finger over the valve or hose opening (a suction should be felt).

5. Check the tachometer again. The engine speed should have dropped at least 50 rpm. It should return to normal when the finger is removed from the opening.

6. If the engine does not change speed or if the change is less than 50 rpm, the hose is clogged or the valve is defective. Check the hose first. If the hose is not clogged, replace, do not attempt to repair, the PCV valve.

7. Test the new valve in the above manner, to make sure that it is operating properly.

Heated Air Intake System

THERMOSTAT OPERATED TYPE—1970–72 TEST

To check the operation of the duct and valve assembly, start with a cold engine and an air cleaner temperature of less than 100°F. Check the valve plate. It should be up in the "heat on" position. If it is not, check for proper installation of the spring and free operation of the plate in the duct. If interference is present, correct by realigning plate.

To check the operation of the thermostat, remove the duct and valve from the air cleaner. Move the valve plate by hand to make sure it does not bind in the duct. Then, immerse it in a pan of water, making sure that the thermostat capsule is covered. Raise the water temperature to 100°F, and allow a few minutes to stabilize the temperature. The valve plate should be in the "heat on" position.

Raise the water temperature to 135°F, and again allow a few minutes to stabilize the temperature. The valve plate should move to the "heat off" position. If the valve plate does not operate properly under these conditions, the duct and valve assembly must be replaced.

Now start the engine. At engine idle, the plate should move to the closed or "heat on" position. Remember, the engine and the air cleaner must be about room temperature or below so the temperature sensing switch will not begin to control the valve plate.

VACUUM OPERATED TYPE—1973–76

Duct and Valve Assembly Test

1. Either start with a cold engine or remove the air cleaner from the engine for at least half an hour. While cooling the air cleaner, leave the engine compartment hood open.
2. Tape a thermometer, of known accuracy, to the inside of the air cleaner so that it is near the temperature sensor unit. Install the air cleaner on the engine but do not fasten its securing nut.
3. Start the engine. With the engine cold and the outside temperature less than 90°F, the door should be in the "heat on" position (closed to outside air).

   NOTE: *Due to the position of the air cleaner on some cars, a mirror may be necessary when observing the position of the air door.*
4. Operate the throttle lever rapidly to ½–¾ of its opening and release it. The air door should open to allow outside air to enter and then close again.
5. Allow the engine to warm up to normal temperature. Watch the door. When it opens to the outside air, remove the cover from the air cleaner. The temperature should be over 90°F and no more than 130°F; 105°F is about normal. If the door does not work within these temperature ranges, or fails to work at all, check for linkage or door binding.

If binding is not present and the air door is not working, proceed with the vacuum tests, given below. If these indicate no faults in the vacuum motor and the door is not working, the temperature sensor is defective and must be replaced.

Vacuum Motor Test

NOTE: *Be sure that the vacuum hose that runs between the temperature switch and the vacuum motor is not pinched by the retaining clip under the air cleaner. This could prevent the air door from closing.*

1. Check all of the vacuum lines and fittings for leaks. Correct any leaks. If none are found, proceed with the test.
2. Remove the hose which runs from the sensor to the vacuum motor. Run a hose directly from the manifold vacuum source to the vacuum motor.
3. If the motor closes the air door, it is functioning properly and the temperature sensor is defective.
4. If the motor does *not* close the door and no binding is present in its operation, the vacuum motor is defective and must be replaced.

   NOTE: *If an alternate vacuum source is applied to the motor, insert a vacuum gauge in the line by using a T-fitting. Apply at least 9 in. Hg of vacuum in order to operate the motor.*

Dual Diaphragm Distributor Advance and Retard Mechanisms Test

1. Connect a timing light to the engine. Check the ignition timing.

   NOTE: *Before proceeding with the tests, disconnect any spark control devices, distributor vacuum valves, etc. If these are left connected, inaccurate results may be obtained.*
2. Remove the retard hose from the distributor and plug it. Increase the engine speed. The timing should advance. If it fails to do so, then the vacuum unit is faulty and must be replaced.
3. Check the timing with the engine at normal idle speed. Unplug the retard hose and connect it to the vacuum unit. The timing should instantly be retarded from 4–10°. If this does not occur, the retard diaphragm has a leak and the vacuum unit must be replaced.

Ported Vacuum Switch (Distributor Vacuum Control Valve) Test

1. Check the routing and connection of all vacuum hoses.
2. Attach a tachometer to the engine.
3. Bring the engine up to the normal operating temperature. The engine must not be overheated.
4. Note the engine rpm, with the transmission in Neutral, and the throttle in the curb idle position.

5. Disconnect the vacuum hose from the intake manifold at the temperature-sensing valve. Plug or clamp the hose.

6. Note the idle rpm with the hose disconnected. If there is no change in rpm, the valve is good. If there is a drop of 100 or more rpm, the valve should be replaced. Replace the vacuum line.

7. Check to make sure that the all-season cooling mixture meets specifications, and that the correct radiator cap is in place and functioning.

8. Block the radiator air flow to induce a higher-than-normal temperature condition.

9. Continue to operate until the engine temperature or heat indicator shows above normal.

If engine speed by this time has increased 100 or more rpm, the temperature-sensing valve is satisfactory. If not, it should be replaced.

Deceleration (Distributor Vacuum Advance Control) Valve Test

1. Connect a tachometer to the engine and bring the engine to the normal operating temperature.

2. Check the idle speed and set to specifications with the headlights on high beam if necessary.

3. Turn off the headlights and note the idle rpm.

4. Remove the plastic cover from the valve. Slowly turn the adjusting screw counterclockwise without pressing in. After five, and no more than six, turns, the idle speed should suddenly increase to about 1000 rpm. If the speed does not increase after six turns, push inward on the end of the valve spring retainer and release. Speed should now increase.

5. Slowly turn the adjusting screw clockwise until the idle speed drops to the speed noted in Step 3. Make one more turn clockwise.

6. Increase the engine speed to 2000 rpm, hold for five seconds and release the throttle. The engine should return to idle speed within four seconds. If idle is not resumed in four seconds, back off the dashpot adjustments and repeat the check. If the idle is not resumed in three seconds with the dashpot backed off, turn the deceleration valve adjustment screw an additional quarter turn clockwise and repeat the check. Repeat the quarter-turn adjustments and idle return checks until the engine returns to idle within the required time.

7. If it takes more than one complete turn from Step 5 to meet the idle return time specification, replace the valve.

Spark Delay Valve Test

NOTE: *If the distributor vacuum line contains a cut-off solenoid, it must be open during this test.*

1. Detach the vacuum line from the distributor at the spark delay valve end. Connect a vacuum gauge to the valve, in its place.

2. Connect a tachometer to the engine. Start the engine and rapidly increase its speed to 2,000 rpm with the transmission in Neutral.

3. As soon as the engine speed is increased, the vacuum gauge reading should drop to zero.

4. Hold the engine speed at a steady 2,000 rpm. It should take longer than two seconds for the gauge to register 6 in. Hg. If it takes less than two seconds, the valve is defective and must be replaced.

5. If it takes longer than the number of seconds specified in the application chart for the gauge to reach 6 in. Hg, disconnect the vacuum gauge from the spark delay valve. Disconnect the hose which runs from the spark delay valve to the carburetor at the valve end. Connect the vacuum gauge to this hose.

6. Start the engine and increase its speed to 2,000 rpm. The gauge should indicate 10–16 in. Hg. If it does not, there is a blockage in the carburetor vacuum port or else the hose itself is plugged or broken. If the gauge reading is within specification, the valve is defective.

7. Reconnect all vacuum lines and remove the tachometer, once testing is completed.

Distributor Modulator System

SYSTEM TEST

1. By-pass the control module by connecting the carburetor vacuum port and single vacuum hose (upstream of temperature-sensing vacuum control valve) to the distributor together at the rear of the engine.

2. Check the distributor vacuum ad-

vance operation. If it is correct, the difficulty is probably in the modulator system.

3. Return all connections to normal. Pull the hose from the carburetor vacuum port and connect a vacuum gauge in its place. Note the vacuum reading at 1500 rpm. Remove the gauge and replace the hose.

4. By-pass the control module as in Step 1. Connect the vacuum gauge to the primary (outside) distributor vacuum connection. Note the vacuum reading at 1500 rpm.

5. Remove the control module by-pass hose. Reconnect the module hoses. If the vacuum reading is zero or less than that in Step 3, check for blockage or leaks in the vacuum system. If the vacuum readings are about equal, proceed with Step 6.

6. Leave the vacuum gauge connected as in Step 4. With the engine idling at normal operating temperature, raise the rear wheels. Disconnect the thermal switch from the pillar post. Hold it in your hand long enough to warm it above 68°F.

7. Shift into Drive and slowly accelerate to 35 mph. Note the vacuum reading. If the gauge reads zero at all speeds, check the electrical connections, hose connections, and control module. If the vacuum cuts in between 20–30 mph, the system is operating correctly. If vacuum cuts in at the start of acceleration or before 20 mph, check the electrical connections, hose connections, control module, and speed sensor.

SPEED SENSOR TEST

1. Unplug the sensor. Using an ohmmeter, attach one lead to each speed sensor wire connection. The reading should be 40–60 ohms at room temperature.

2. Attach one ohmmeter lead to the black wire on the speed sensor and the other to the sensor housing. The ohmmeter should read zero.

3. If the readings are not correct, replace the sensor. It is not reparable.

THERMAL SWITCH TEST

1. Unplug the switch. Connect one ohmmeter lead to the gray (or white) wire and the other to the black.

2. Warm the switch in your hand. The ohmmeter should read zero with the switch at 58–68°F or higher.

3. Chill the switch with cold water. There should be an ohmmeter reading at 58–50°F or lower.

4. Replace the switch if the readings are not correct. It is not reparable.

CONTROL MODULE TEST

1. Unplug the connector for the red and gray wires from the module. Reconnect the red wires with a jumper wire.

2. Connect a vacuum gauge to the carburetor vacuum port. Run the engine at fast idle and note the vacuum reading. Reconnect the vacuum hose.

3. Connect the vacuum gauge to the primary (outside) distributor vacuum connection.

4. Ground the gray (or white) wire from the control module.

5. Run the engine at fast idle and note the vacuum reading.

6. Replace the control module if the vacuum reading in Step 5 is not the same or slightly less than that taken in Step 2. The module is not reparable.

Electronic Spark Control

SYSTEM TEST

1. Raise the rear of the car until the rear wheels are clear of the ground by at least 4 in. Support the rear of the car with safety stands, and place blocks in front and back of the front wheels.

CAUTION: *The rear of the car must be firmly supported during this test. If one of the rear wheels should come in contact with the ground while it is turning, the car will move forward very rapidly and unexpectedly.*

2. Disconnect the vacuum hose from the distributor vacuum advance chamber. This is the outer hose on cars with a dual diaphragm.

3. Connect the hose to a vacuum gauge.

4. Pour hot water on the temperature-sensing switch to make sure that it is above 65°F. The temperature sensor is located on the right door pillar.

5. Start the engine, apply the foot brake, and shift the transmission selector lever to Drive.

6. Slowly release the foot brake and allow the transmission to shift into High (Third) gear.

7. Have a friend observe the vacuum

gauge while you raise the speed of the engine until the speedometer reads 37 mph.

8. If the system is working properly, there should be no reading on the vacuum gauge until the speedometer reads 37 mph, at which time the vacuum gauge should show a reading.

9. If the vacuum gauge shows a reading below 37 mph, a component in the electronic spark control system is defective. If the vacuum gauge does not show a reading, even above 37 mph, there is either a defective component in the electronic spark control system, or there is a broken or clogged vacuum passage between the carburetor and the distributor.

VACUUM PASSAGES CHECK

1. Disconnect the vacuum hose that runs from the carburetor to the distributor modulator vacuum valve at the vacuum valve. Connect the end of the hose that was just disconnected to a vacuum gauge. Start the engine and keep the transmission selector lever in either the Park or Neutral position. Raise the speed of the engine to about 1500 rpm and observe the reading on the vacuum gauge. If the vacuum gauge shows a reading, this section of the system is OK. If the vacuum gauge does not show a reading, either the vacuum port in the carburetor is plugged or the vacuum hose out of the carburetor is plugged or broken.

2. Reconnect the vacuum hose that was disconnected in Step 1. Disconnect the vacuum hose coming out of the distributor modulator vacuum valve and connect it to a vacuum gauge. Disconnect the lead wires that run to the distributor modulator. Start the engine and raise the speed of the engine to about 1500 rpm. If the vacuum gauge does not show a reading, the distributor modulator vacuum valve is defective.

3. On cars with air conditioning, reconnect the vacuum hose to the modulator valve but leave the wires to the valve disconnected. Disconnect the vacuum hose coming out of the second nipple on the distributor control valve. Start the engine and raise the speed of the engine to about 1500 rpm. If the vacuum gauge does not show a reading, the distributor control valve is defective or the hose leading to the valve is plugged or broken.

4. Reconnect all vacuum lines but leave the lead wires to the distributor modulator vacuum valve disconnected. Disconnect the vacuum hose to the distributor vacuum advance chamber. Connect this hose to a vacuum hose. Start the engine and raise the speed of the engine to about 1500 rpm. Observe the reading on the vacuum gauge. If the gauge does not show a reading, the hose to the distributor vacuum advance chamber is plugged or broken.

TEMPERATURE SENSOR TEST

1. Disconnect the two wires that run to the temperature sensor. Pour hot water on the sensor to ensure that its temperature is above 65°F. Connect the two leads of an ohmmeter to the two leads from the temperature sensor. At temperatures above 65°F, the ohmmeter should show a reading. Cool the temperature sensor with ice to bring its temperature below 65°F. At temperatures below 49°F, the ohmmeter should not show a reading. If the temperature sensor does not react this way, it is defective.

2. With the ignition switch turned on, connect the ground wire on a test light to a good metal ground and insert the probe of the light into the connector of the red and yellow wire running to the temperature sensor connector. If the test light does not light, either the wire is defective or the ignition switch is defective.

SPEED SENSOR TEST

1. Disconnect the wires running from the speed sensor connector. Connect the two leads on an ohmmeter to the two wires running to the speed sensor. At room temperature the ohmmeter should show a reading of about 40–60 ohms.

2. Disconnect the speed sensor from the speedometer cable. Connect one lead on a ohmmeter to the inside core of the speed sensor and the other to the body of the speed sensor. The ohmmeter should not show a reading.

3. If the speed sensor does not give these readings, it is defective.

DISTRIBUTOR MODULATOR VACUUM VALVE AND AMPLIFIER TEST

If the system operation check showed that the electronic spark control system was not operating properly, and if the vacuum passages check OK, and the temperature and speed sensors checked out OK, then the trouble is either in the modulator valve or the amplifier.

1. Pour hot water on the temperature sensor to ensure that its temperature is above 65°F.

2. Disconnect the lead wires to the modulator valve at the quick-disconnect connector.

3. Turn the ignition switch on.

4. Connect the ground wire on a test light to a good ground and insert the probe end into the two wires leading to the connector to which the wires from the distributor modulator vacuum valve connect. If connecting to one of these wires lights the test light, and the electronic spark control system is not working correctly, the distributor modulator vacuum valve is defective. If connecting to one of these wires does not light the test light, the amplifier is defective.

Transmission Regulated Spark System

SYSTEM TEST

Manual Transmission

NOTE: *When performing the following tests, be sure that the temperature switch is kept above 65°F, except as noted. On models equipped with a spark delay valve, the spark delay valve must be removed for this test to be valid.*

1. Connect a vacuum gauge between the distributor and the distributor modulator valve, using a T-connector.

2. Start the engine. With the transmission in Neutral, the vacuum gauge should read zero.

3. Increase engine speed to between 1,000–1,500 rpm with the clutch pedal depressed. The vacuum reading should remain at zero.

4. With the clutch still depressed, place the transmission in High gear. Increase engine speed, as before. The vacuum gauge should now read at least 6 in. Hg. If it does not, proceed further with testing. Remember to shift into Neutral or stop the engine before engaging the clutch.

5. Unfasten the transmission switch lead from the distributor modulator terminal. Connect the lead in series with a low amperage test lamp and the positive side of the battery.

6. Move the gear shift lever through all of the gears. The test lamp should remain on until High gear is entered.

7. If the lamp stays on when the transmission is in High, either the switch is defective or the circuit is grounded. If it fails to come on at all, the switch is defective or the circuit has a loose wire.

8. If the transmission switch is functioning properly but the system check indicates that something is still wrong, proceed with the temperature switch test under "Electronic Spark Control Temperature Sensor Test."

Exhaust Gas Recirculation System

SYSTEM TEST

1. Allow the engine to warm up, so that the coolant temperature has reached at least 125°F.

2. Disconnect the vacuum hose which runs from the temperature cut-in valve to the EGR valve at the EGR valve end. Connect a vacuum gauge to this hose with a T-fitting.

3. Increase engine speed. The gauge should indicate a vacuum. If no vacuum is present, check the following:

   a. The carburetor—look for a clogged vacuum port.

   b. The vacuum hoses—including the vacuum hoses to the transmission modulator.

   c. The temperature cut-in valve—if no vacuum is present at its outlet with the engine temperature above 125°F and vacuum available from the carburetor, the valve is defective.

4. If all of the above tests are positive, check the EGR valve itself.

5. Connect an outside vacuum source and a vacuum gauge to the valve.

6. Apply vacuum to the EGR valve. The valve should open at 3–10 in. Hg, the engine idle speed should slow down, and the idle quality should become more rough.

7. If this does not happen, i.e., the EGR valve remains closed, the EGR valve is defective and must be replaced.

8. If the valve stem moves but the idle remains the same, the valve orifice is clogged and must be cleaned.

NOTE: *If an outside vacuum source is not available, disconnect the hose which runs between the EGR valve and the* *temperature cut-in valve and plug the hose connections on the cut-in valve. Connect the EGR valve hose to a source of intake manifold vacuum and watch the idle. The results should be the same as in steps 6–7, above.*

TEMPERATURE CUT-IN VALVE (EGR PORTED VACUUM SWITCH)

Valve Bench Test

1. Remove the valve from the engine.
2. Connect an outside source of vacuum to the top port on the valve. Leave the bottom port vented to the atmosphere.
3. Use ice or an aerosol spray to cool the valve below 60°F.
4. Apply 20 in. Hg vacuum to the valve. The valve should hold a minimum of 19 in. Hg vacuum for 5 minutes without leaking down.
5. Leave the vacuum source connected to the valve and place it, along with a high temperature thermometer, into a non-metallic, heat-resistant container full of water.
6. Heat the water. The vacuum in the valve should drop to zero once the temperature of the water reaches about 125°F.
7. Replace the valve if it fails either of the tests.

VACUUM MODULATOR TEST

NOTE: *The vacuum modulator is used only with an automatic transmission.*

1. Remove the vacuum modulator from the car.
2. Connect the modulator to an outside vacuum source: a distributor tester, for example.

   NOTE: *The vacuum source should be adjusted to supply 18 in. Hg, with the end of the vacuum line blocked off.*
3. Connect the vacuum line from the vacuum source to the EGR port on the vacuum modulator.
4. The vacuum modulator should hold the 18 in. Hg reading. If it does not, then the diaphragm is leaking and must be replaced.

EGR Venturi Vacuum Amplifier System

SYSTEM TEST

The amplifiers have built-in calibrations, and no external adjustments are required. If the amplifier tests reveal it is malfunctioning, replace the amplifier. All connections are located on one side of the amplifier. A vacuum connector and hose assembly is used to assure that proper connections are made at the amplifier. The amplifier is retained with a sheet-metal screw.

1. Operate the engine until normal operating temperatures are reached.
2. Before the vacuum amplifier is checked, inspect all other basic components of the EGR System (EGR valve, EGR/PVS valve, hoses, routing, etc.).
3. Check vacuum amplifier connections for proper routing and installation. If necessary, refer to the typical vacuum amplifier schematic.
4. Remove hose at EGR valve.
5. Connect vacuum gauge to EGR hose. Gauge must read in increments of at least 1 in. Hg graduation.
6. Remove hose at carburetor venturi (leave off).
7. With engine at curb idle speed, vacuum gauge reading should be within ±0.3 in. Hg of specified bias value as shown in amplifier specifications for other than zero bias. Zero bias may read from 0 to 0.5 in. Hg. If out of specification, replace amplifier.
8. Depress accelerator and release after engine has reached 1500 to 2000 rpm. After engine has returned to idle, the vacuum must return to bias noted in Step 7. If bias has changed, replace amplifier. Also, if vacuum shows a marked increase (greater than 1 in. Hg) during acceleration period, the amplifier should be replaced.
9. Hook up venturi hose at carburetor with engine at curb idle rpm. If a sizeable increase in ouput vacuum is observed, (more than 0.5 in. Hg above Step 7), check idle speed. High idle speed could increase output vacuum due to venturi vacuum increase. See engine decal for correct idle specifications.
10. Check amplifier reservoir and connections as follows: Disconnect external reservoir hose at amplifier and cap or plug. Depress accelerator rapidly to 1500 to 2000 rpm. The vacuum should increase to 4 in. Hg or more. If out of specifications, replace amplifier.

Temperature Activated Vacuum System

SYSTEM TEST

1. Disconnect the vacuum line from the primary port of the distributor. Connect a

vacuum gauge to the line by means of a T-fitting. Connect the other end of the T-fitting to the distributor.

2. Be sure that the air temperature is above 65°F. Hot water may be used to warm the temperature switch, which is located in the front door pillar.
3. Place the transmission in Park or Neutral. Start the engine.
4. Run the engine at idle; the vacuum gauge should read zero.
5. Increase the engine speed to 1,500 rpm or slightly more. The gauge should read 5 in. Hg or better.
6. If there is no vacuum reading, check for leaking, plugged, or pinched lines and fittings.
7. Detach the EGR port hose and plug up the carburetor line. The vacuum gauge should read zero.
8. If it does not, check the lines and then proceed with the 3-way vacuum valve test, below. If it does, go on to Step 9.
9. Next, detach one of the power leads from the 3-way vacuum valve.
10. Speed the engine up to 1,500 rpm or more. The vacuum gauge should now read 6 in. Hg or better.
11. If the system fails to function as outlined, check the ambient temperature switch, the EGR valve, or the 3-way vacuum valve.
12. If everything is functioning properly, reconnect the leads and vacuum lines after disconnecting the vacuum gauge.

TEMPERATURE SWITCH TEST

See "Electronic Spark Control Component Tests—Temperature Sensor."

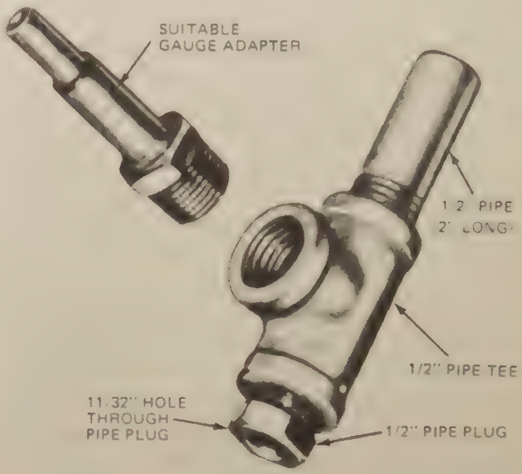
3-WAY SOLENOID VALVE TEST

1. Remove the 3-way vacuum valve from the car.
2. Connect a vacuum gauge to the horizontal port at the *bottom* of the valve.
3. Apply a vacuum source to the horizontal port at the *top* of the valve.
4. Ground one of the valve terminals while connecting the other terminal to a 12V power supply. The vacuum gauge should read zero.

THERMACTOR SYSTEM

Before performing any extensive diagnosis of the emission control systems, verify that all specifications on the Certification Label are met, because the following systems or components may cause symptoms that appear to be emission related.

a. Improper vacuum connections
b. Vacuum leaks
c. Ignition timing
d. Plugs, wires, cap and rotor
e. Carburetor float level
f. Carburetor main metering jets
g. Choke operation



Fabricated Test Gauge Adapter

FABRICATING A TEST GAUGE ADAPTER

In order to test the 3 major components of a Thermactor system (air pump, check valve and by-pass valve), a pressure gauge and adapter are required. The adapter can be fabricated as follows:

1. Obtain these items:
    a. ½-inch pipe tee
    b. ½-inch pipe, 2-inches long and threaded at one end
    c. ½-inch pipe plug
    d. ½-inch reducer bushing or other suitable gauge adapter
2. Apply sealer to threaded ends of pipe, plug and bushing. Assemble as shown in the illustration.
3. Drill $^{11}/_{32}$ inch (0.3437) diameter hole through center of pipe plug. Clean out chips after drilling.
4. Attach pressure gauge with ¼-psi increments to bushing or adapter.

AIR PUMP TESTS

CAUTION: *Do not hammer on, pry, or bend the pump housing while tightening the drive belt or testing the pump.*

Belt Tension and Air Leaks

1. Before proceeding with the tests, check the pump drive belt tension to see if it is within specifications.

2. Turn the pump by hand. If it has seized, the belt will slip, producing noise. Disregard any chirping, squealing, or rolling sounds from inside the pump; these are normal when it is turned by hand.

3. Check the hoses and connections for leaks. Hissing or a blast of air is indicative of a leak. Soapy water, applied lightly around the area in question, is a good method for detecting leaks.

Air Output Tests

1. Disconnect the air supply hose at the antibackfire valve.

2. Connect a vacuum gauge, using a suitable adaptor, to the air supply hose.

NOTE: *If there are two hoses plug the second one up.*

3. With the engine at normal operating temperature, increase the idle speed and watch the vacuum gauge.

4. The air flow from the pump should be steady and fall between 2–6 psi. If it is unsteady or falls below this, the pump is defective and must be replaced.

Pump Noise Diagnosis

The air pump is normally noisy; as engine speed increases, the noise of the pump will rise in pitch. The rolling sound the pump bearings make is normal, however if this sound becomes objectionable at certain speeds, the pump is defective and will have to be replaced.

A continual hissing sound from the air pump pressure relief valve at idle, indicates a defective valve. Replace the relief valve.

If the pump rear bearing fails, a continual knocking sound will be heard. Since the rear bearing is not separately replaceable, the pump will have to be replaced as an assembly.

CHECK VALVE TEST

1. Before starting the test, check all of the hoses and connections for leaks.

2. Detach the air supply hose(s) from the check valve(s).

3. Insert a suitable probe into the check valve and depress the plate. Release it; the plate should return to its original position against the valve seat. If binding is evident, replace the valve.

4. Repeat Step 3 if two valves are used.

5. With the engine running at normal operating temperature, gradually increase its speed to 1,500 rpm. Check for exhaust gas leakage. If any is present, replace the valve assembly.

NOTE: *Vibration and flutter of the check valve at idle speed is a normal condition and does not mean that the valve should be replaced.*

AIR BY-PASS VALVE TEST

1. Detach the hose, which runs from the by-pass valve to the check valve, at the by-pass valve hose connection.

2. Connect a tachometer to the engine. With the engine running at normal idle speed, check to see that air is flowing from the by-pass valve hose connection.

3. Speed the engine up, so that it is running at 1,500–2,000 rpm. Allow the throttle to snap shut. The flow of air from the by-pass valve at the check valve hose connection should stop momentarily and air should then flow from the exhaust port on the valve body or the silencer assembly.

4. Repeat Step 3 several times. If the flow of air is not diverted into the atmosphere from the valve exhaust port or if it fails to stop flowing from the hose connection, check the vacuum lines and connections. If these are tight, the valve is defective and requires replacement.

5. A leaking diaphragm will cause the air to flow out both the hose connection and the exhaust port at the same time. If this happens, replace the valve.

COMPONENT REPLACEMENT

PCV Valve

Disconnect the ventilation hose at the oil filler cap on V8 applications and pull out the PCV valve from its grommet. On six-cylinder engines, disconnect the ventilation hose from its connection at the front of the valve cover and pull out the PCV valve from its grommet. Clean out all of the passageways in the hoses and fittings with a kerosene soaked rag. Install a new PCV valve in its grommet and connect the ventilation hose.

Evaporative Control Charcoal Canister

Loosen and remove the canister mounting bolts from the mounting bracket. Disconnect the purge hose from the air cleaner and the feed hose from the fuel tank. Discard the old canister and install a new unit. Make sure that the hoses are connected properly.

Ported Vacuum Switch (Distributor Vacuum Control Valve)

1. Drain about one gallon of coolant out of the radiator.
2. Tag the vacuum hoses that attach to the control valve and disconnect them.
3. Unscrew and remove the control valve.
4. Install the new control valve.
5. Connect the vacuum hoses.
6. Fill the cooling system.

Heated Air Intake System

TEMPERATURE OPERATED DUCT AND VALVE ASSEMBLY

1. Remove the hex-head cap screws that secure the air intake duct and valve assembly to the air cleaner.
2. Remove the air intake duct and valve assembly from the engine.
3. If the duct and valve assembly was removed because of a suspected temperature malfunction, check the operation of the thermostat and valve plate assembly. Refer to the Air Intake Duct test for the proper procedure.
4. If inspection reveals that the valve plate is sticking or the thermostat is malfunctioning, remove the thermostat and valve plate as follows:
   a. Detach the valve plate tension spring from the valve plate using longnose pliers. Loosen the thermostat locknut and unscrew the thermostat from the mounting bracket. Grasp the valve plate and withdraw it from the duct.
5. Install the air intake duct and valve assembly on the shroud tube.
6. Connect the air intake duct and valve assembly to the air cleaner and tighten the 2 hex-head retaining cap screws.
7. If it was necessary to disassemble the thermostat and air duct and valve, assemble the unit as follows:
   a. Install the valve plate. Install the locknut on the thermostat, and screw the thermostat into the mounting bracket. Install the valve plate tension spring on the valve plate and duct.
   b. Check the operation of the thermostat and air duct assembly. Refer to the Air Intake Duct Test for the proper procedure. Tighten the locknut.
8. Install the vacuum override motor (if applicable) and check for proper operation.

VACUUM OPERATED DUCT AND VALVE ASSEMBLY

1. Disconnect the vacuum hose at the vacuum motor.
2. Remove the hex head cap screws that secure the air intake duct and valve assembly to the air cleaner.
3. Remove the duct and valve assembly from the engine.
4. Position the duct and valve assembly to the air cleaner and heat stove tube. Install the attaching cap screws.
5. Connect the vacuum line at the vacuum motor.

Spark Delay Valve

1. Locate the spark delay valve in the distributor vacuum line and disconnect it from the line.
2. Install a new spark delay valve in the line, making sure that the black end of the valve is connected to the line from the carburetor and the color coded end is connected to the line from the spark delay valve to the distributor.

Dist-O-Vac and ESC Temperature Sensor

1. Open the right door and remove the two screws that attach the temperature sensor to the right door pillar.
2. Disconnect the lead wires from the temperature sensor.
3. Connect the lead wires to the new sensor.
4. Position the sensor on the door pillar and install the attaching screws.

Dist-O-Vac and ESC Speed Sensor

1. Disconnect the lead wires from the sensor.
2. Disconnect the speed sensor from the speedometer cable.
3. Position the O-rings on both ends of the new speed sensor.
4. Connect both ends of the speedometer cable to the speed sensor.

5. Connect the lead wires to the speed sensor.

ESC Amplifier

1. Locate the amplifier under the instrument panel, near the glove compartment.
2. Disconnect the wiring harness from the amplifier.
3. Remove the two amplifier attaching screws and remove the amplifier.
4. Position a new amplifier under the instrument panel and connect the wiring harness to it.
5. Install the two amplifier attaching screws.

ESC Distributor Vacuum Modulator Valve

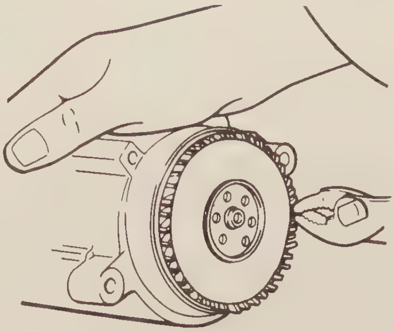
1. Tag the hoses that attach to the modulator and disconnect them from the amplifier.
2. Disconnect the lead wires from the modulator.
3. Remove the #2 left front valve cover bolt (six-cylinder) or the inboard left front valve cover bolt and remove the modulator.
4. Position the new modulator on the valve cover and install the attaching bolt.
5. Connect the wires and hoses to the modulator.

Thermactor Air Pump

1. Disconnect the air outlet hose at the air pump.
2. Loosen the pump belt tension adjuster.
3. Disengage the drive belt.
4. Remove the mounting bolt and air pump.
5. To install, position the air pump on the mounting bracket and install the mounting bolt.
6. Place drive belt in pulleys and attach the adjusting arm to the air pump.
7. Adjust the drive belt tension to specifications and tighten the adjusting arm and mounting bolts.
8. Connect the air outlet hose to the air pump.

Thermactor Air Pump Filter Fan

1. Loosen the air pump adjusting arm bolt and mounting bracket bolt to relieve drive belt tension.
2. Remove drive pulley attaching bolts and pull drive pulley off the air pump shaft.



Thermactor Air Pump Filter Fan Removal

3. Pry the outer disc loose; then, pull off the centrifugal filter fan with slip-joint pliers.

   CAUTION: *Do not attempt to remove the metal drive hub.*

4. Install a new filter fan by drawing it into position, using the pulley and bolts as an installer. Draw the fan evenly by alternately tightening the bolts, making certain that the outer edge of the fan slips into the housing.

   NOTE: *A slight interference with the housing bore is normal. After a new fan is installed, it may squeal upon initial operation, until its outer diameter sealing lip has worn in, which may require 20 to 30 miles of operation.*

Thermactor Check Valve

1. Disconnect the air supply hose at the valve. (Use a 1¼ in. crowfoot wrench, the valve has a standard, right-hand pipe thread.)
2. Clean the threads on the air manifold adaptor (air supply tube on 302 V8 engine) with a wire brush. Do not blow compressed air through the check valve in either direction.
3. Install the check valve and tighten.
4. Connect the air supply hose.

Thermactor Air By-Pass Value

1. Disconnect the air and vacuum hoses at the air by-pass valve body.
2. Position the air by-pass valve, and connect the respective hoses.

Fuel System

A single-action mechanical fuel pump, driven by the camshaft, is used on all

Mavericks and Comets. The pump is located at the lower left center of the cylinder block on six-cylinder engines, and at the left side of the cylinder front cover on the 302 V8. The pump is permanently sealed and cannot be disassembled for overhaul.

The fuel is filtered by a one-piece filter, located at the carburetor fuel inlet. See Chapter 1 for fuel filter maintenance.

FUEL PUMP

Removal and Installation

1. Disconnect the plug and inlet and outlet lines from the fuel pump.
2. Remove the fuel pump retaining bolts and carefully pull the pump and old gasket away from the block.
3. Discard the old gasket. Clean the mating surfaces on the block and position a new gasket on the block, using oil-resistant sealer.
4. Mount the fuel pump and gasket to the engine block, being careful to insert the pump lever (rocker arm) in the engine block, aligning it correctly above the camshaft lobe.

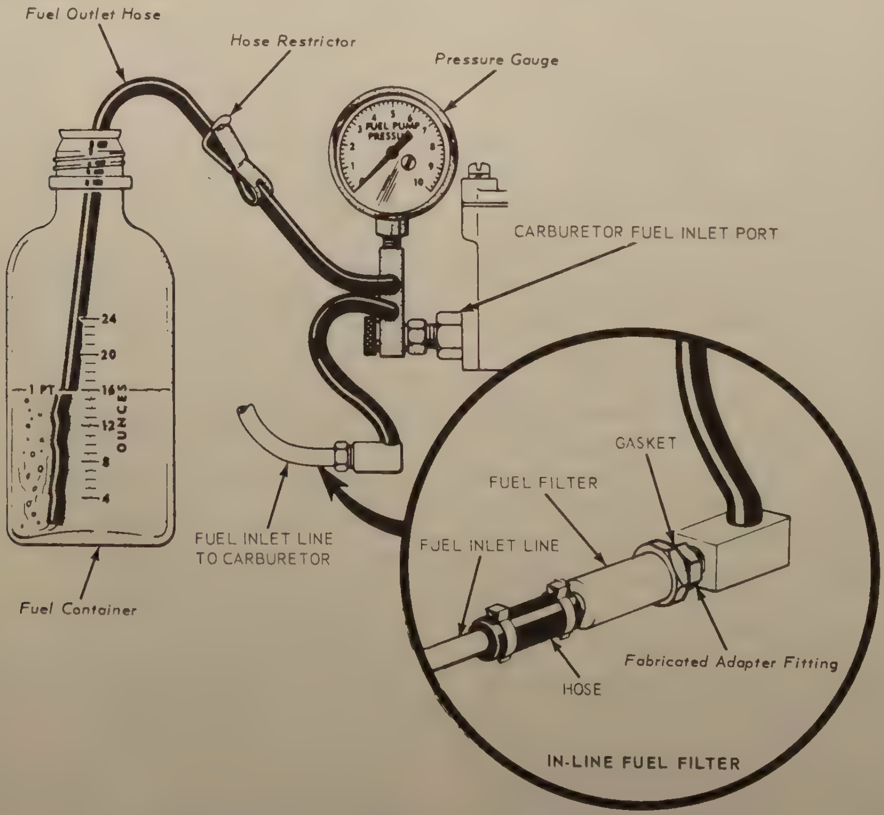
NOTE: *If resistance is felt while positioning the fuel pump on the block, the camshaft lobe is probably on the high position. To ease installation, connect a remote engine starter switch to the engine and "tap" the switch until resistance fades.*

5. While holding the pump securely against the block, install the retaining bolts. On six-cylinder engines, torque the bolts to 12–15 ft lbs, and on V8s, 20–24 ft lbs.
6. Unplug and reconnect the fuel lines at the pump.
7. Start the engine and check for fuel leaks. Also check for oil leaks where the fuel pump attaches to the block.

Testing and Adjustment

No adjustments may be made to the fuel pump. Before removing and replacing the old fuel pump, the following test may be made while the pump is still installed on the engine.

CAUTION: *To avoid accidental ignition of fuel during the test, first remove the coil high-tension wire from the distributor and the coil.*


Fuel Outlet Hose
Hose Restrictor
Pressure Gauge
FUEL PUMP PRESSURE
CARBURETOR FUEL INLET PORT
1 PT
24
20
16
12
8
4
OUNCES
GASKET
FUEL FILTER
FUEL INLET LINE
FUEL INLET LINE TO CARBURETOR
Fuel Container
Fabricated Adapter Fitting
HOSE
IN-LINE FUEL FILTER

Typical Fuel Pump Pressure and Capacity Test Equipment

1. If a fuel pressure gauge is available, connect the gauge to the engine and operate the engine until the pressure stops rising. Stop the engine and take the reading. If the reading is within the specifications given in the "Tune-Up Specifications" chart in Chapter 2, the malfunction is not in the fuel pump. Also check the pressure drop after the engine is stopped. A large pressure drop below the minimum specification indicates leaky valves. If the pump proves to be satisfactory, check the tank and inlet line.

2. If a fuel pressure gauge is not available, disconnect the fuel line at the pump outlet, place a vessel beneath the pump outlet, and crank the engine. A good pump will force the fuel out of the outlet in steady spurts. A worn diaphragm spring may not provide proper pumping action.

3. As a further test, disconnect and plug the fuel line from the tank at the pump, and hold your thumb over the pump inlet. If the pump is functioning properly, a suction should be felt on your thumb. No suction indicates that the dump diaphragm is leaking, or that the diaphragm linkage is worn.

4. Check the crankcase for gasoline. A ruptured diaphragm may leak fuel into the engine.

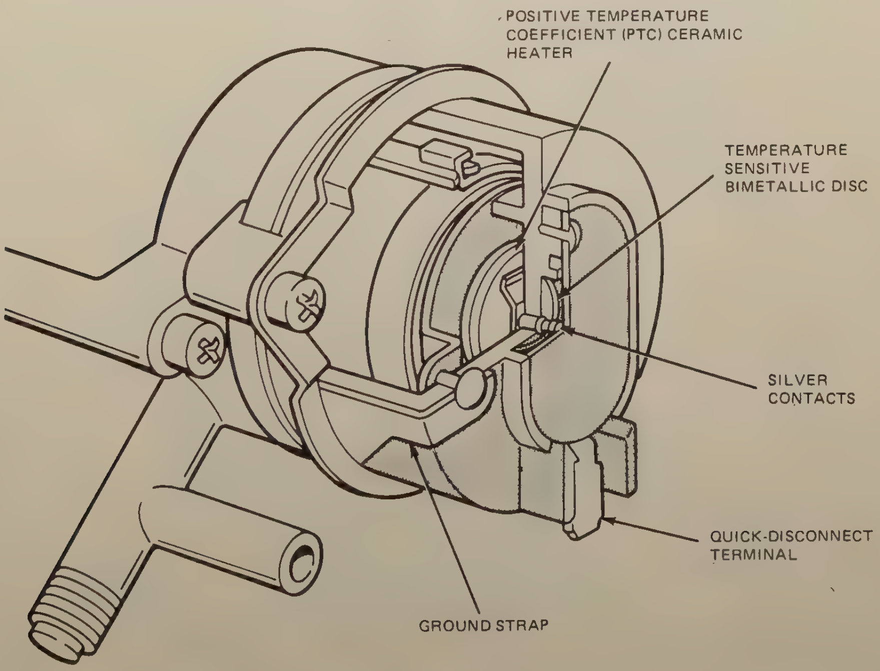
ELECTRIC CHOKE

Starting in 1973, 302 V8 equipped models, all 1974 California models, and all 1975–76 models nationwide use an electrically-assisted choke to reduce exhaust emissions of carbon monoxide during warmup. The system consists of a choke cap, a thermostatic spring, a bimetal sensing disc (switch) and a ceramic positive temperature coefficient (PTC) heater.

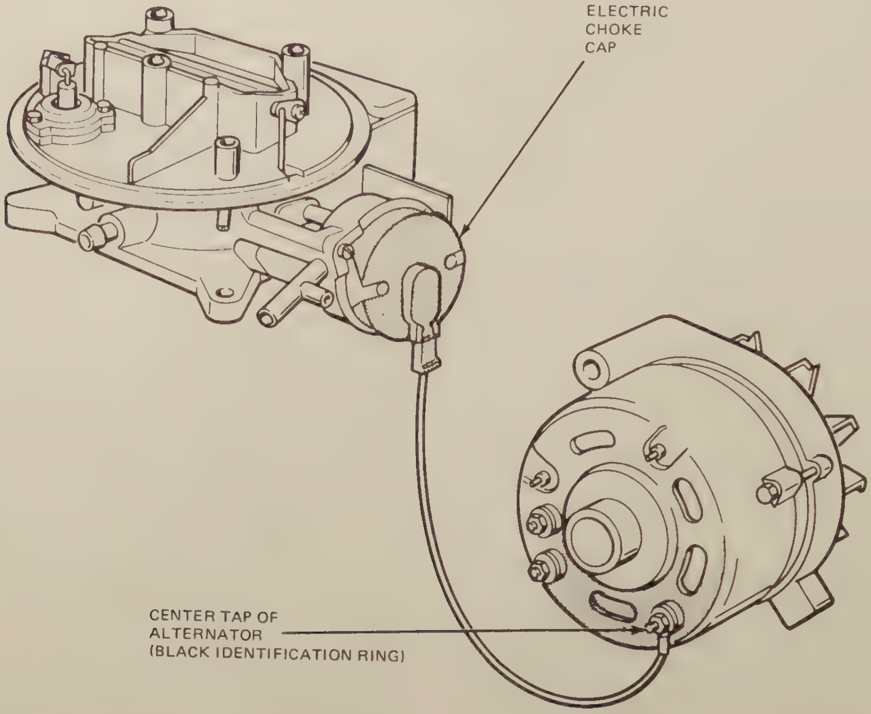
The choke is powered from the center tap of the alternator, so that current is constantly applied to the temperature sensing disc. The system is grounded through the carburetor body. At temperatures below approximately 60°F, the switch is open and no current is supplied to the ceramic heater, thereby resulting in normal unassisted thermostatic spring choking action. When the temperature rises above about 60°F, the temperature sensing disc closes and current is supplied to the heater, which in turn, acts on the thermostatic spring. Once the heater starts, it causes the thermostatic spring to pull the choke plate(s) open within 1½ minutes, which is sooner than it would open if non-assisted.

Electric Choke Operational Test

1. Detach the electrical lead from the choke cap.


POSITIVE TEMPERATURE COEFFICIENT (PTC) CERAMIC HEATER
TEMPERATURE SENSITIVE BIMETALLIC DISC
SILVER CONTACTS
QUICK-DISCONNECT TERMINAL
GROUND STRAP

Electric Choke Components



Electric Choke Wiring

2. Use a jumper lead to connect the terminal on the choke cap and the wire terminal, so that the electrical circuit is still completed.

3. Start the engine.

4. Hook up a test light between the connector on the choke lead and ground.

5. The test light should glow. If it does not, current is not being supplied to the electrically assisted choke.

6. Connect the test light between the terminal on the alternator and the terminal on the choke cap. If the light now glows, replace the lead, since it is not passing current to the choke assist.

CAUTION: *Do not ground the terminal on the alternator while performing Step 6.*

7. If the light still does not glow, the fault lies somewhere in the electrical system. Check the system out.

If the electrically assisted choke receives power but still does not appear to be functioning properly, reconnect the choke lead and proceed with the rest of the test.

8. Tape the bulb end of the thermometer to the metallic portion of the choke housing.

9. If the electrically assisted choke operates below 55° F, it is defective and must be replaced.

10. Allow the engine to warm up to between 80 and 110°F; at these temperatures the choke should operate for about 1½ minutes.

11. If it does not operate for this length of time, check the bimetallic spring to see if it is connected to the tang on the choke lever.

12. If the spring is connected and the choke is not operating properly, replace the cap assembly.

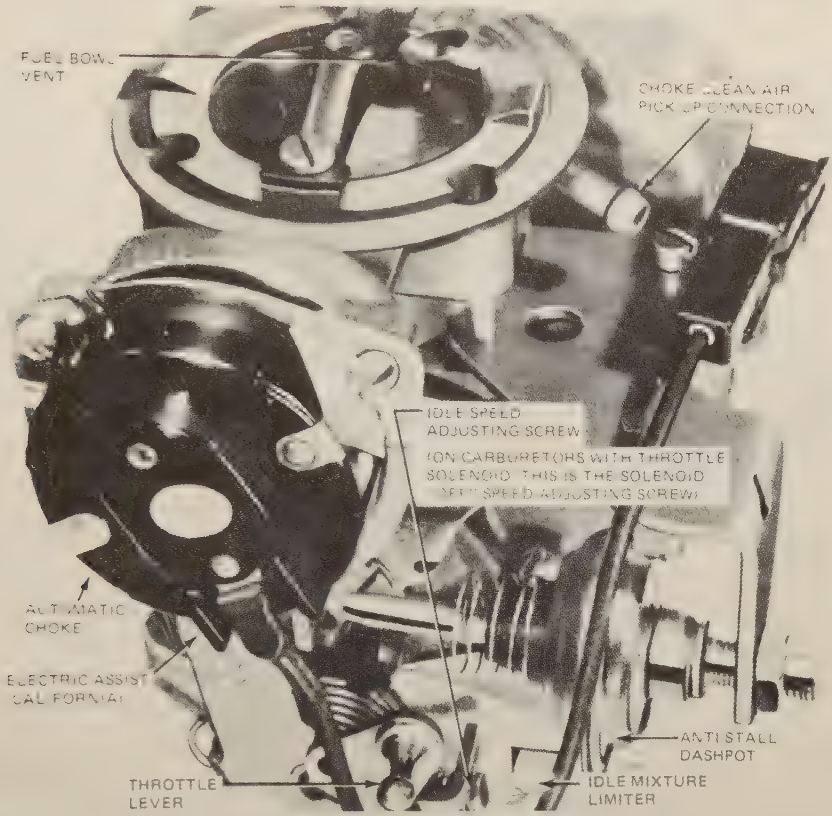
CARBURETORS

Carburetor applications are as follows:

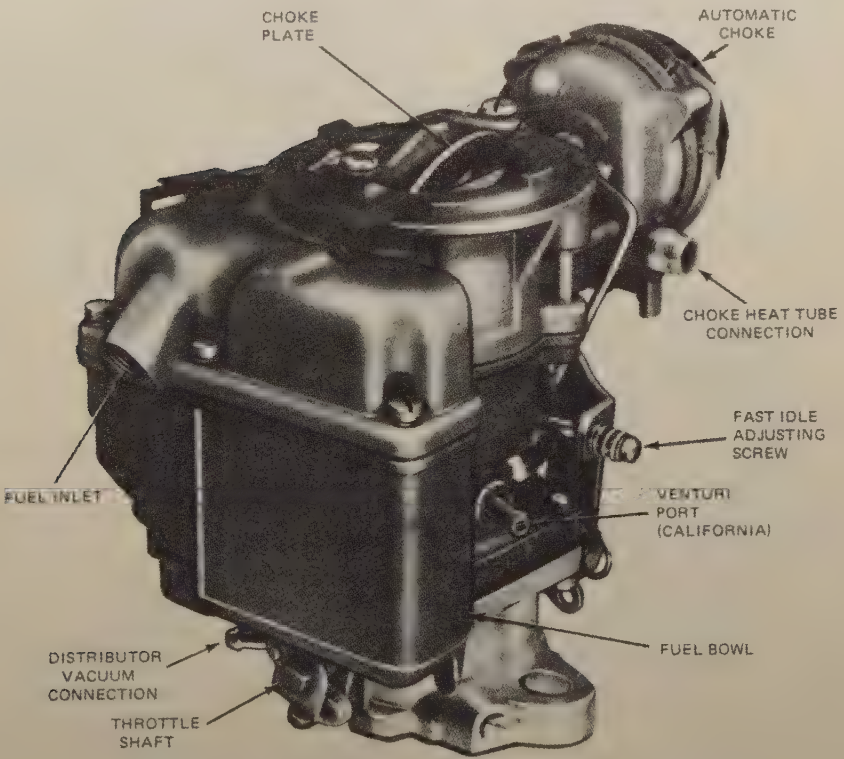
1970–74 170, 200 Six	Carter YF 1 bbl
1970–74 250 Six	Carter RBS 1 bbl
1975–76 200, 250 Six	Carter YFA 1 bbl
1971–74 302 V8	Autolite (Motorcraft) 2100D 2 bbl
1975–76 302 V8	Motorcraft 2150 2 bbl

In accordance with Federal emissions regulations, all 3 carburetors are equipped with idle mixture screw limiter caps. These caps are installed to prevent tampering with the carburetor fuel mixture screw(s) so that the engine cannot be adjusted to a richer idle mixture.

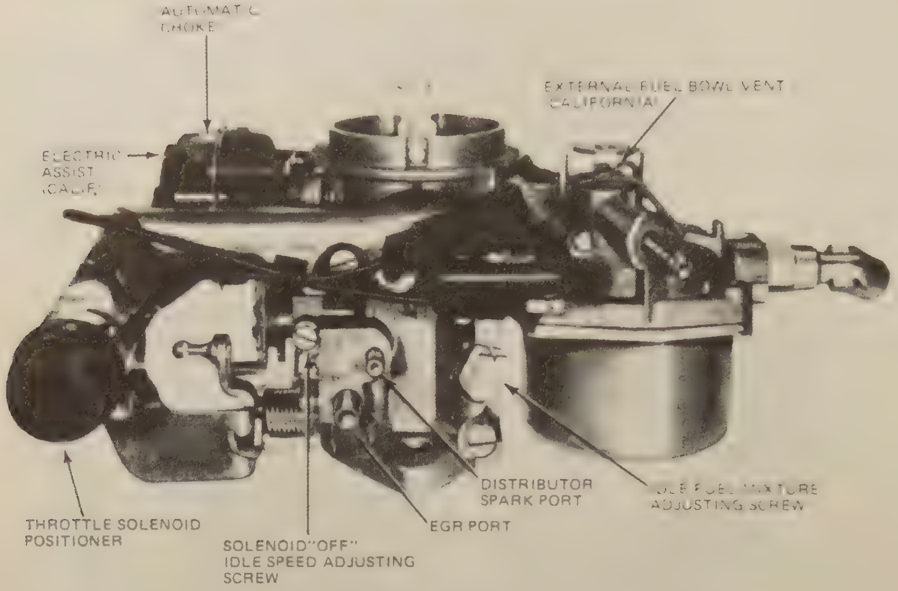
Most models are equipped with a throttle


FUEL BOWL VENT
CHOKE CLEAN AIR PICK UP CONNECTION
IDLE SPEED ADJUSTING SCREW
(ON CARBURETORS WITH THROTTLE SOLENOID THIS IS THE SOLENOID OFF SPEED ADJUSTING SCREW)
AUTOMATIC CHOKE
ELECTRIC ASSIST (CALIFORNIA)
THROTTLE LEVER
ANTI STALL DASHPOT
IDLE MIXTURE LIMITER

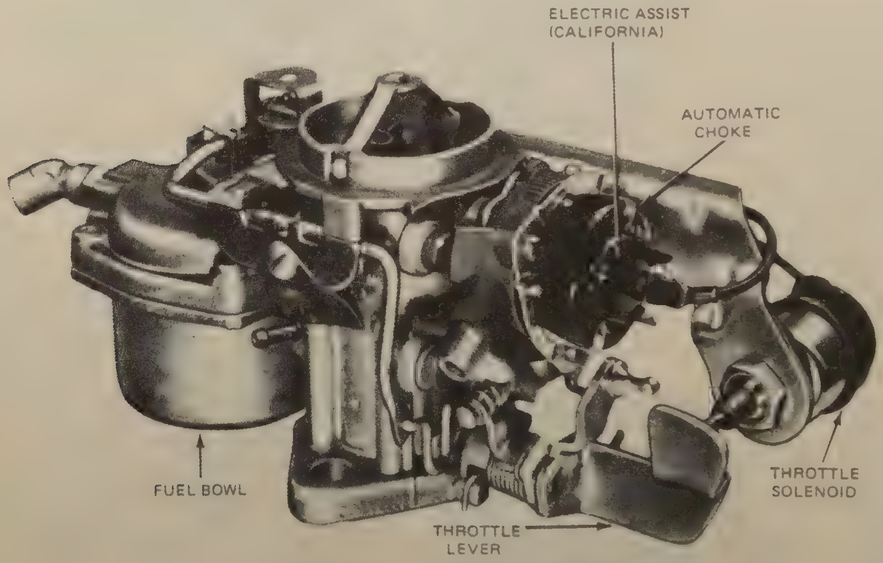
Carter YF-IV Carburetor—Rear View, YFA-IV similar


CHOKE PLATE
AUTOMATIC CHOKE
CHOKE HEAT TUBE CONNECTION
FAST IDLE ADJUSTING SCREW
FUEL INLET
VENTURI PORT (CALIFORNIA)
FUEL BOWL
DISTRIBUTOR VACUUM CONNECTION
THROTTLE SHAFT

Carter YF-IV Carburetor—Left Front View, YFA-IV similar


AUTOMATIC CHOKE
EXTERNAL FUEL BOWL VENT (CALIFORNIA)
ELECTRIC ASSIST (CALIF.)
DISTRIBUTOR SPARK PORT
IDLE FUEL MIXTURE ADJUSTING SCREW
THROTTLE SOLENOID POSITIONER
EGR PORT
SOLENOID "OFF" IDLE SPEED ADJUSTING SCREW

Carter RBS-IV Carburetor—Right Side View


ELECTRIC ASSIST (CALIFORNIA)
AUTOMATIC CHOKE
FUEL BOWL
THROTTLE SOLENOID
THROTTLE LEVER

Carter RBS-IV Carburetor—Left Side View

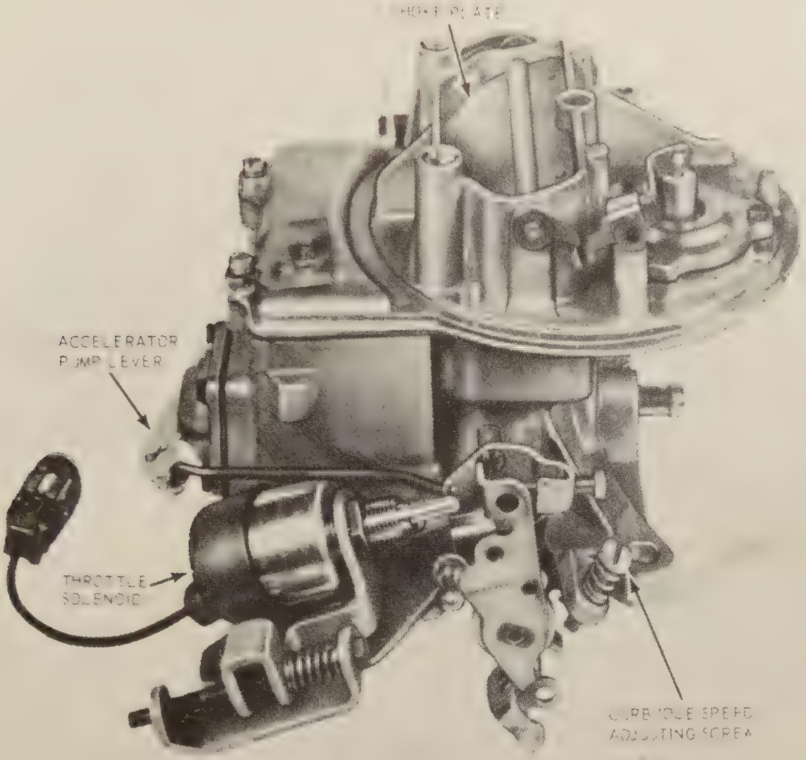
positioner solenoid. The purpose of a throttle solenoid is to prevent the engine from running on (dieseling) after the ignition is turned off. Dieseling is a common occurance with many cars using emission control systems that require a leaner fuel mixture, a higher operating temperature, and a higher curb idle speed. The throttle solenoid prevents running-on and dieseling by closing the throttle plate(s) after the key is turned off, thereby shutting off the air and gas to the overheated combusition chambers.

Throttle Solenoid (Anti-dieseling Solenoid) Test

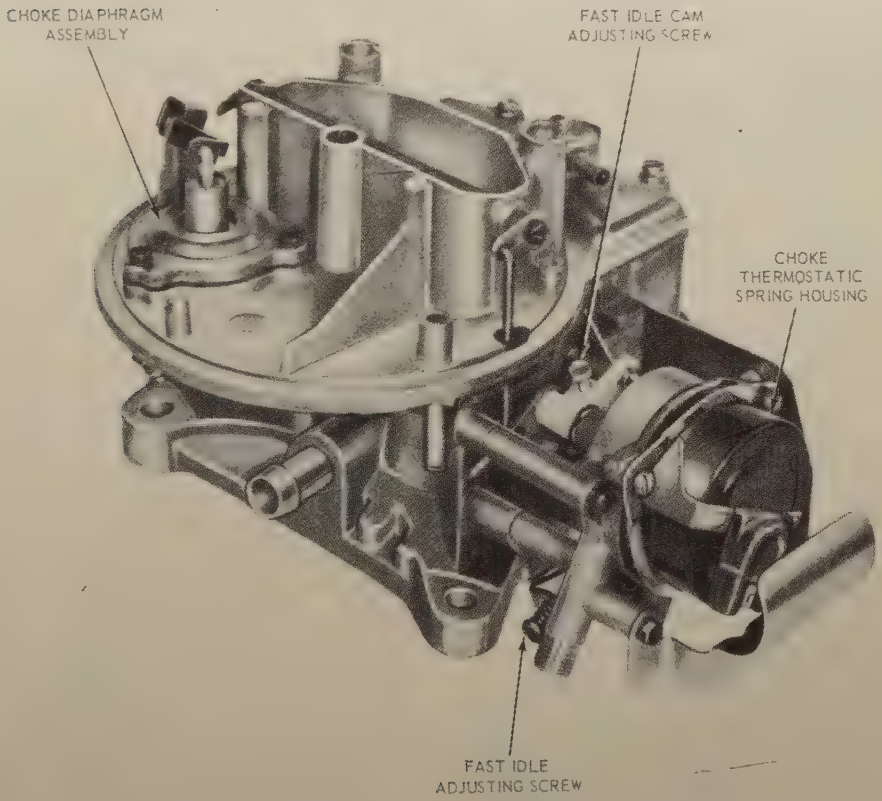
1. Turn the ignition key on and open the throttle. The solenoid plunger should extend (solenoid energize).

2. Turn the ignition off. The plunger should retract, allowing the throttle to close.

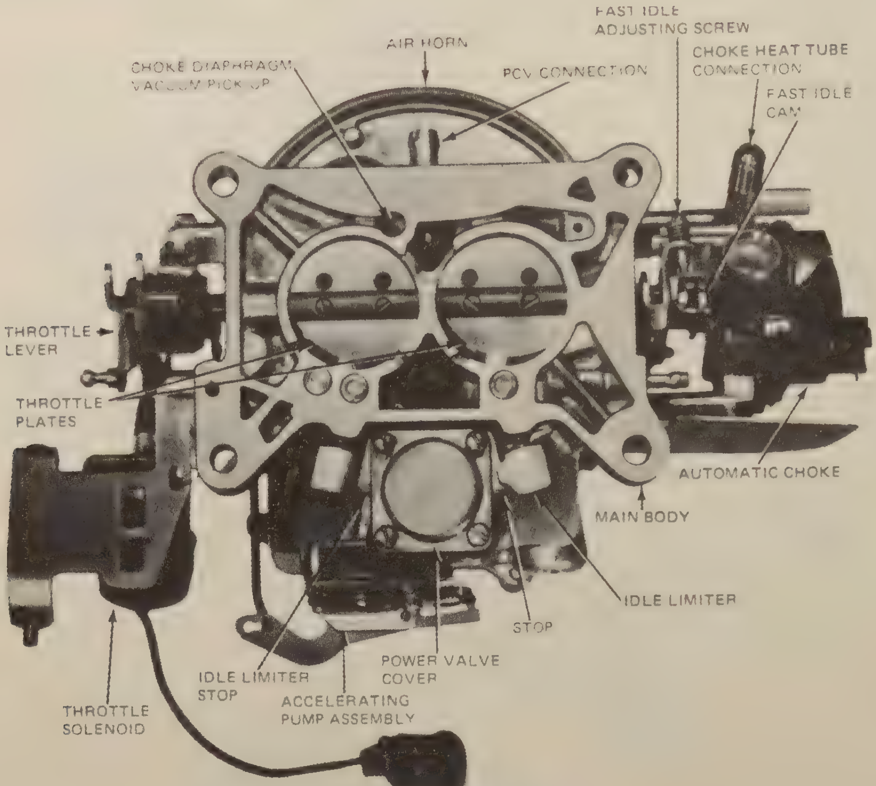
NOTE: *With the antidieseling solenoid de-energized, the carburetor idle speed adjusting screw must make contact with the throttle shaft to prevent the throttle*


CHOKE PLATE
ACCELERATOR PUMP LEVER
THROTTLE SOLENOID
CURB IDLE SPEED ADJUSTING SCREW

Motorcraft 2100D-2V Carburetor—Left Side View, 2150-2V similar


CHOKE DIAPHRAGM ASSEMBLY
FAST IDLE CAM ADJUSTING SCREW
CHOKE THERMOSTATIC SPRING HOUSING
FAST IDLE ADJUSTING SCREW

Motorcraft 2100D-2V Carburetor—Right Rear ¾ View


FAST IDLE ADJUSTING SCREW
AIR HORN
CHOKE DIAPHRAGM VACUUM PICK UP
PCV CONNECTION
CHOKE HEAT TUBE CONNECTION
FAST IDLE CAM
THROTTLE LEVER
THROTTLE PLATES
AUTOMATIC CHOKE
MAIN BODY
IDLE LIMITER
STOP
POWER VALVE COVER
IDLE LIMITER STOP
ACCELERATING PUMP ASSEMBLY
THROTTLE SOLENOID

Motorcraft 2100D-2V Carburetor—Bottom View, 2150-2V similar

plates from jamming in the throttle bore when the engine is turned off.

3. If the solenoid is functioning properly and the engine is still dieseling, check for one of the following:

a. High idle or engine shut off speed;

b. Engine timing not set to specification;

c. Binding throttle linkage;

d. Too low an octane fuel being used.

Correct any of these problems as necessary.

4. If the solenoid fails to function as outlined in steps 1–2, disconnect the solenoid leads; the solenoid should de-enegerize. If it does not, it is jammed and must be replaced.

5. Connect the solenoid to a 12 V power source and to ground. Open the throttle so that the plunger can extend. If it does not, the solenoid is defective.

6. If the solenoid is functioning correctly and no other source of trouble can be found, the fault probably lies in the wiring between the solenoid and the ignition switch or in the ignition switch itself. Remember to reconnect the solenoid when finished testing.

NOTE: *On some 1970–71 models, dieseling may occur when the engine is turned off because of feedback through the alternator warning light circuit. A diode kit is available from Ford to cure this problem. A failure of this diode may also lead to a similar problem.*

Removal and Installation

1. Remove the air cleaner.

2. Disconnect the throttle cable or rod at the throttle lever. Disconnect the distributor vacuum line, exhaust gas recirculation line (1973 and later models), inline fuel filter, choke heat tube and the positive crankcase ventilation hose at the carburetor.

3. Disconnect the throttle solenoid (if so equipped) and electric choke assist (1973 and later models so equipped), at their connectors.

4. Remove the carburetor retaining nuts. Lift off the carburetor carefully, taking care not to spill any fuel. Remove the carburetor

mounting gasket and discard it. Remove the carburetor mounting spacer, if so equipped, from the intake manifold.

5. Prior to installation, clean the gasket mounting surfaces of the intake manifold, spacer (if so equipped), and carburetor. When using a spacer, use two new gaskets, sandwiching the spacer between the gaskets. If a spacer is not used, only one new carburetor mounting gasket is required.

6. Place the new gasket(s) and spacer (if so equipped) on the carburetor mounting studs. Position the carburetor on top of the gasket and hand tighten the retaining nuts. Then tighten the nuts in a criss-cross pattern to 10–15 ft lbs.

7. Connect the throttle linkage, the distributor vacuum line, exhaust gas recirculation line (1973 and later models), inline fuel filter, choke heat tube, positive crankcase ventilation hose, throttle solenoid (if so equipped) and electric-choke assist (models so equipped).

8. Adjust the curb idle speed, the idle fuel mixture and the accelerator pump stroke (2100D and 2150 only). Install the air cleaner.

Overhaul

Carter YF, YFA

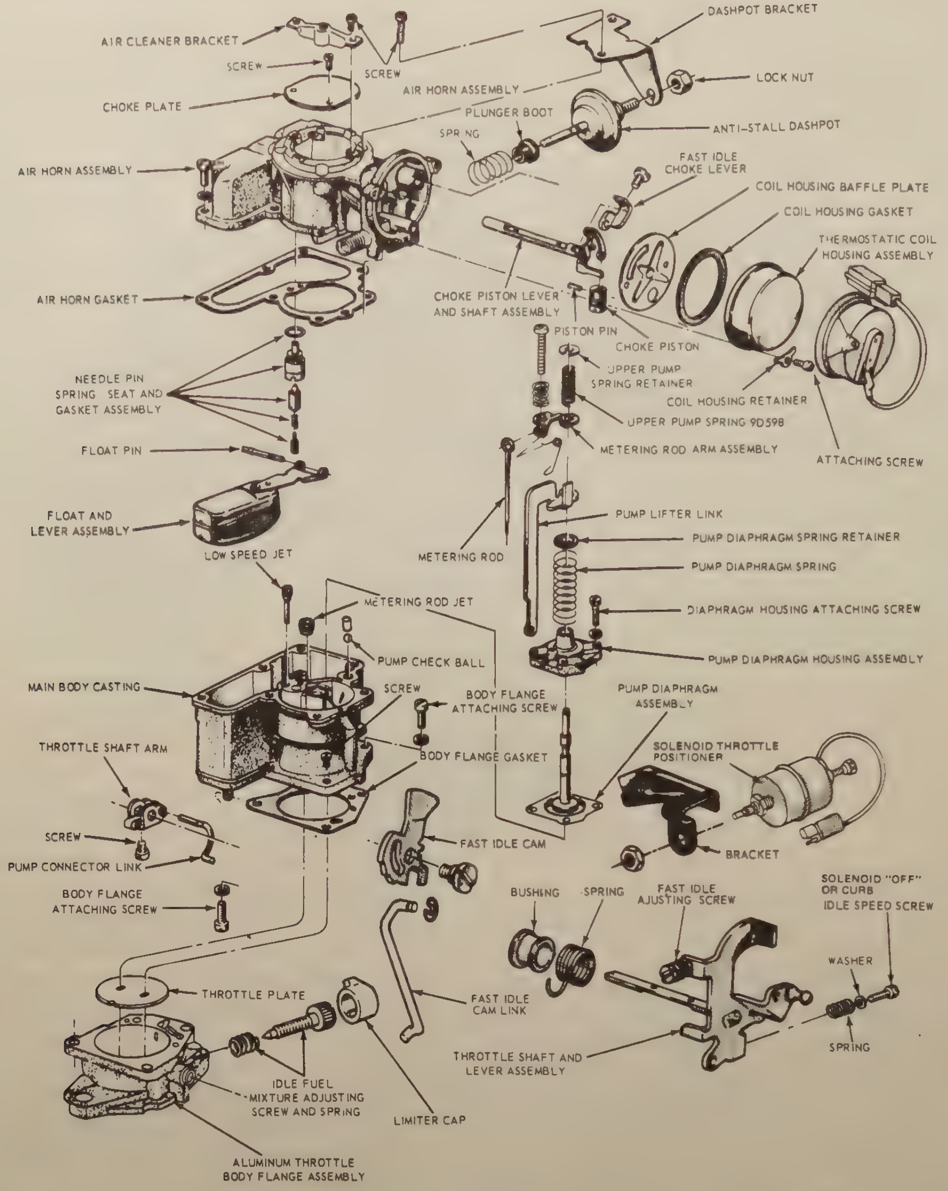
Disassembly

During the disassembly operations, refer to the exploded view of components which accompanies this section. Separate the throttle connector rod retainer from the choke connector rod and remove the rod from the fast idle link. Remove the automatic choke components, including housing retaining screws, housing assembly, housing gasket and baffle plate, trip lever and pin assembly and fast idle link. Remove the air horn retaining screws, the dashpot and bracket, and the air horn and air horn gasket from the carburetor main body. With the air horn assembly inverted, remove the float pin and the float and lever assembly. With the air horn assembly turned upright, catch the needle pin, spring, needle and seat. Remove the float needle seat and gasket. Remove the air cleaner bracket and the choke plate retaining screws. If necessary, the ends of the screws may be filed and new screws used during assembly. Remove the choke plate. With the fast idle cam spring disengaged from the cam spring lever on the choke piston lever and shaft assembly, rotate the choke shaft and piston assembly in the counterclockwise direction until the choke piston is withdrawn from the choke piston cylinder. Remove the choke assembly from the air horn and remove the piston pin, piston, fast idle cam and spring from the piston lever and shaft assembly. With the main body casting inverted, catch the accelerating pump check needle as it falls out. With the throttle shaft arm spring disconnected, loosen the throttle shaft arm screw and remove the arm and pump connector link. Remove the retaining screws of the accelerating pump diaphragm housing and withdraw the diaphragm assembly, lifter link, metering rod and fuel bowl baffle plate as a unit. Separate the metering rod arm spring from the metering rod and remove the metering rod from the assembly. Compress the upper pump spring and remove the retainer. Lift off the upper spring and remove the metering rod arm assembly and pump lifter link from the diaphragm shaft. Compress the lower spring and remove the spring retainer, spring and pump diaphragm assembly from the housing. Use a special tool or a screwdriver of appropriate size to remove the low speed jet and metering rod jet. Remove the retaining screws which attach the throttle body flange to the main body casting and separate the components. Remove the gasket between the throttle body and main body. Filing the ends if necessary, remove the screws which retain the throttle plate (use new screws during assembly) and slide the throttle shaft and lever assembly out of the throttle body flange.

> NOTE: *Do not remove the idle mixture limiter caps or the mixture screws from the throttle body.*

Assembly

Prior to assembly, clean and inspect all components. Wash all components (except the accelerating pump diaphragm and the anti-stall dashpot assembly) in a suitable commercial solvent. Rinse all solvent-cleaned parts in kerosene to remove traces of the cleaning solvent, then dry with compressed air. Do not use wire or drills to clean openings in the carburetor—use of such devices will enlarge the hole or pas-


AIR CLEANER BRACKET
SCREW
SCREW
DASHPOT BRACKET
AIR HORN ASSEMBLY
LOCK NUT
CHOKE PLATE
PLUNGER BOOT
SPRING
ANTI-STALL DASHPOT
AIR HORN ASSEMBLY
FAST IDLE CHOKE LEVER
COIL HOUSING BAFFLE PLATE
COIL HOUSING GASKET
THERMOSTATIC COIL HOUSING ASSEMBLY
AIR HORN GASKET
CHOKE PISTON LEVER AND SHAFT ASSEMBLY
PISTON PIN
CHOKE PISTON
UPPER PUMP SPRING RETAINER
NEEDLE PIN SPRING SEAT AND GASKET ASSEMBLY
COIL HOUSING RETAINER
UPPER PUMP SPRING 9D598
FLOAT PIN
METERING ROD ARM ASSEMBLY
ATTACHING SCREW
PUMP LIFTER LINK
FLOAT AND LEVER ASSEMBLY
PUMP DIAPHRAGM SPRING RETAINER
LOW SPEED JET
METERING ROD
PUMP DIAPHRAGM SPRING
METERING ROD JET
DIAPHRAGM HOUSING ATTACHING SCREW
PUMP CHECK BALL
PUMP DIAPHRAGM HOUSING ASSEMBLY
MAIN BODY CASTING
SCREW
BODY FLANGE ATTACHING SCREW
PUMP DIAPHRAGM ASSEMBLY
THROTTLE SHAFT ARM
BODY FLANGE GASKET
SOLENOID THROTTLE POSITIONER
SCREW
FAST IDLE CAM
BRACKET
PUMP CONNECTOR LINK
BODY FLANGE ATTACHING SCREW
BUSHING
SPRING
FAST IDLE AJUSTING SCREW
SOLENOID "OFF" OR CURB IDLE SPEED SCREW
WASHER
THROTTLE PLATE
FAST IDLE CAM LINK
SPRING
THROTTLE SHAFT AND LEVER ASSEMBLY
IDLE FUEL MIXTURE ADJUSTING SCREW AND SPRING
LIMITER CAP
ALUMINUM THROTTLE BODY FLANGE ASSEMBLY

Carter YF-IV Carburetor Disassembled, YFA-IV similar

sage being cleaned, thus changing the operating characteristics of the carburetor.

Install the throttle shaft and lever assembly to the throttle body flange, then position the throttle plate on its shaft so that the notch in the plate is lined up with the slotted idle port in the throttle body flange. Install the throttle plate retaining screws so that they are snug, but not tight. Move and rotate the shaft to ensure that the throttle plate does not bind in its bore and reposition the plate if necessary. Tighten the throttle plate retaining screws and stake or peen into place.

Using a new gasket, join the main body casting with the throttle body flange and evenly tighten the retaining screws. Using the proper size screwdriver or special jet tool, install the metering rod jet and low speed jet. Install the pump diaphragm to the accelerating pump diaphragm housing and position the lower spring on the diaphragm shaft and housing. Install the spring retainer, pump lifter link, metering rod arm and spring assembly, and the upper spring on the diaphragm shaft. Depress the spring and install the upper retainer. Install the metering rod to the meter rod arm as shown in the illustration accompanying the preceding section. Line up the pump diaphragm with its housing and install the retaining screws. Position the fuel bowl baffle plate on the pump assembly and line up the pump housing, pump lifter link, metering rod and baffle plate with the main body casting.

NOTE: *Be sure that the vacuum passage in the diaphragm housing is lined up with that of the main body.*)

Install the assembly to the main body casting, being sure that the pump lifter link is engaged with the main body, that the baffle plate has its grooves in the main body, and that the metering rod is inserted into the metering rod jet. Install the pump housing screws so that they are snug, but not tight. Pushing down on the diaphragm shaft to compress the diaphragm, tighten the retaining screws evenly. Adjust the metering rod. Install the throttle shaft arm and pump connector link to the throttle shaft and pump lifter link. Tighten the locking screw and connect the throttle shaft arm return spring. Install the fast idle cam and spring to the choke lever and shaft assembly. Install the choke piston and pin to the choke piston lever and shaft, then disengage the cam spring from the lever and install the choke shaft assembly to the air horn. Align the piston with the cylinder, rotate the shaft assembly in the clockwise direction until the piston pin is inside the cylinder. Position the cam spring on the cam spring lever of the choke lever assembly.

NOTE: *When the cam spring is properly positioned, the tangs on the cam and the choke lever will be lined up with one in front of the other.*

With the choke plate in position on the shaft, install the retaining screws without tightening fully. As with the throttle plate, move and rotate the shaft to ensure that the plate moves freely, then tighten the screws and peen or stake to secure.

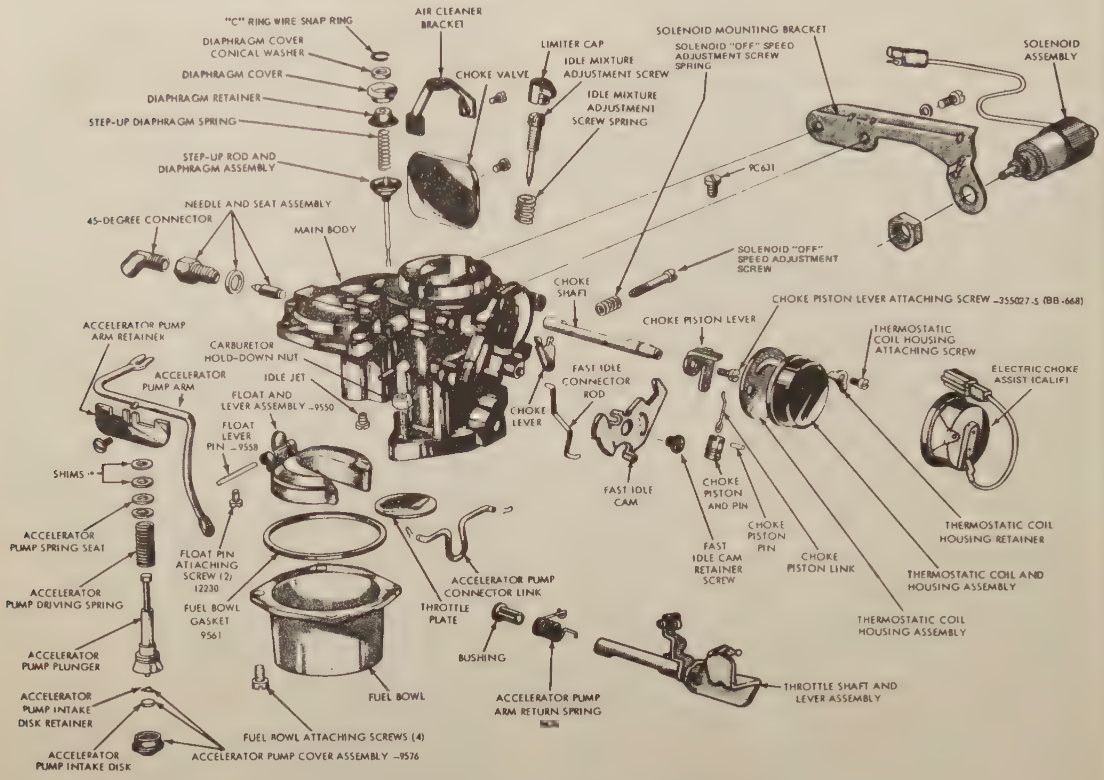
Install the needle valve seat and gasket in the air horn. Invert the air horn and install the needle, pin spring, needle pin, float and lever, and float pin. Adjust the float level. Install the pump check needle to the main body casting and position the air horn (with new gasket) and the anti-stall dashpot and bracket on the main body. Secure the dashpot bracket and evenly tighten the screws attaching the air horn to the main body. Install the choke trip lever and fast idle link to the choke housing. Be sure that the lever and link properly engage each other and the choke piston lever and shaft. Install the coil housing, gasket and baffle plate (with identification mark facing outward). The gasket should be between the baffle and the coil housing, and the thermostatic spring should engage the tang of the choke lever. Install the retainers and screws, set the housing to the proper setting, and tighten the screws. Install the air cleaner bracket and attach the throttle connector rod retainer to the fast idle link. Install the choke connector rod to the throttle lever and fast idle link. Secure the air horn to the main body and connect the connector rod retainer to the choke connector rod.

CARTER RBS

Disassembly

Remove the anti-stall dashpot or solenoid and its bracket. Remove the choke housing retaining screws, the choke housing and its gasket and withdraw the choke piston lever, piston and wire link. (See accompanying illustration for choke housing components.) Remove the air cleaner anchor screw bracket. Remove the choke plate shaft fork lever; choke plate screws and plate, and withdraw the shaft from the carburetor body. Remove the fast idle cam retainer (with a screwdriver) and plastic collar. Remove the fast idle cam and separate the fast idle connector rod from the cam and fork lever of the choke plate shaft. Remove the connector link clip of the accelerating pump arm and free the pump arm retaining spring from the arm at the pump plunger end. Remove the retaining screw and retainer and withdraw the accelerating pump arm, spring and sleeve. Remove the fuel bowl and gasket and the inlet needle valve assembly.

Tap lightly on the upper end of the plunger shaft to remove the accelerating pump assembly. The pump cover, plunger and spring will drop from the lower end of the casting. Pry the conical washer from the diaphragm cover with a screwdriver and remove the metering rod and diaphragm assembly. The cover may be removed by piercing with a sharp tool and


"C" RING WIRE SNAP RING
AIR CLEANER BRACKET
DIAPHRAGM COVER CONICAL WASHER
DIAPHRAGM COVER
CHOKE VALVE
LIMITER CAP
IDLE MIXTURE ADJUSTMENT SCREW
SOLENOID MOUNTING BRACKET
SOLENOID "OFF" SPEED ADJUSTMENT SCREW SPRING
SOLENOID ASSEMBLY
DIAPHRAGM RETAINER
STEP-UP DIAPHRAGM SPRING
IDLE MIXTURE ADJUSTMENT SCREW SPRING
STEP-UP ROD AND DIAPHRAGM ASSEMBLY
9C631
NEEDLE AND SEAT ASSEMBLY
45-DEGREE CONNECTOR
MAIN BODY
SOLENOID "OFF" SPEED ADJUSTMENT SCREW
CHOKE SHAFT
CHOKE PISTON LEVER ATTACHING SCREW -355027-S (BB-668)
ACCELERATOR PUMP ARM RETAINER
CHOKE PISTON LEVER
THERMOSTATIC COIL HOUSING ATTACHING SCREW
CARBURETOR HOLD-DOWN NUT
FAST IDLE CONNECTOR ROD
ELECTRIC CHOKE ASSIST (CALIF)
ACCELERATOR PUMP ARM
IDLE JET
FLOAT AND LEVER ASSEMBLY -9550
CHOKE LEVER
FLOAT LEVER PIN -9558
SHIMS
FAST IDLE CAM
CHOKE PISTON AND PIN
CHOKE PISTON PIN
THERMOSTATIC COIL HOUSING RETAINER
ACCELERATOR PUMP SPRING SEAT
FLOAT PIN ATTACHING SCREW (2) 12230
FAST IDLE CAM RETAINER SCREW
CHOKE PISTON LINK
THERMOSTATIC COIL AND HOUSING ASSEMBLY
ACCELERATOR PUMP DRIVING SPRING
FUEL BOWL GASKET 9561
ACCELERATOR PUMP CONNECTOR LINK
THROTTLE PLATE
THERMOSTATIC COIL HOUSING ASSEMBLY
ACCELERATOR PUMP PLUNGER
BUSHING
THROTTLE SHAFT AND LEVER ASSEMBLY
ACCELERATOR PUMP INTAKE DISK RETAINER
FUEL BOWL
ACCELERATOR PUMP ARM RETURN SPRING
FUEL BOWL ATTACHING SCREWS (4)
ACCELERATOR PUMP INTAKE DISK
ACCELERATOR PUMP COVER ASSEMBLY -9576

Carter RBS-IV Carburetor Disassembled

prying from the casting. If it is desired to remove the throttle plate or shaft, the throttle plate and the bottom of the mounting flange should be lightly marked to facilitate installation of the plate to its original position. Remove the throttle plate screws, being careful to avoid damage to the shaft, bore and shaft threads if the screws must be filed slightly. Remove the throttle plate and slide the throttle shaft and lever from the carburetor body. Remove the idle mixture limiter cap, idle mixture screw and spring and the idle speed screw and spring. Do not try to remove the slotted idle passage plug located below the idle mixture limiter. The plug is a press fit and should not be repositioned. Clean and inspect the components, noting that the diaphragm, anti-stall dashpot and solenoid should not be washed or soaked in the cleaning solvent and that wires or other hard objects should never be used to clean carburetor passages. Clean the solvent from the parts with compressed air.

Assembly

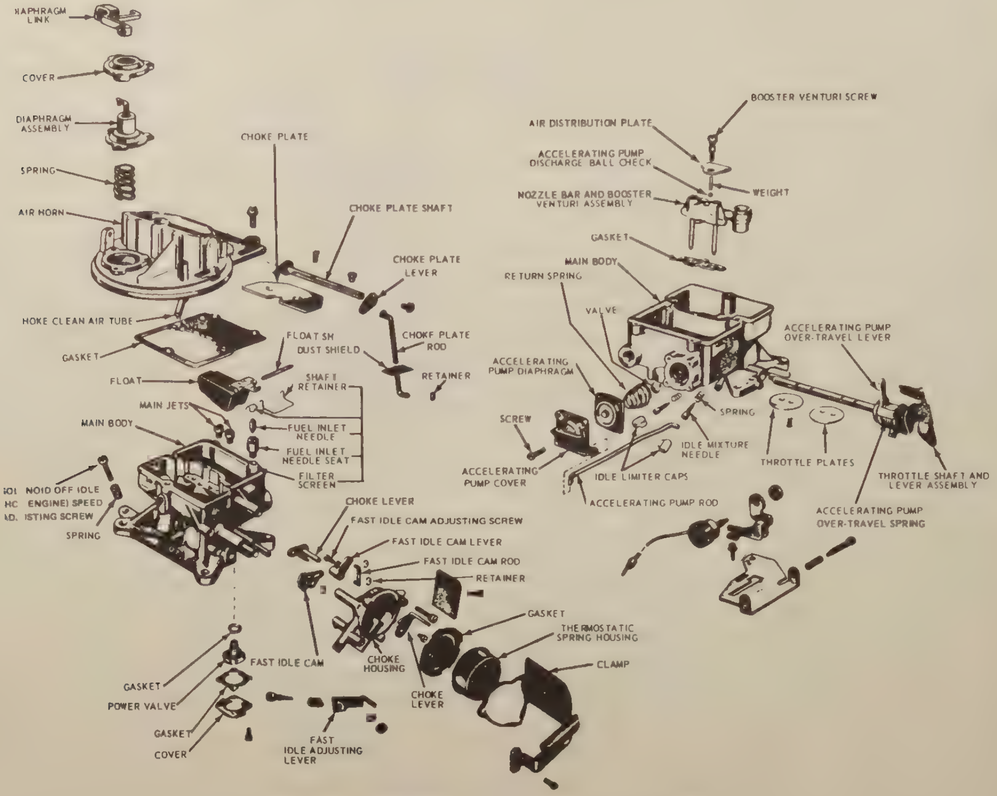
With the main body casting inverted, position the accelerating pump plunger, spring, spring seat and shims in the pump housing. Using a new cover assembly, press the pump cover components into the end of the housing. A $\frac{5}{8}$ in. socket may be used to press the outer edge of the cover while it is lightly tapped into place on the main body casting. Force should not be exerted on the center of the pump cover. Install the idle jet in the main body and turn the carburetor to an upright position. Insert the metering rod halfway into the casting sleeve and drop it into the main body. Position the diaphragm spring and retainer over the diaphragm and install a new diaphragm cover. A $\frac{1}{2}$ in. socket may be used to press on the diaphragm cover while it is being tapped in place. Using a $\frac{7}{16}$ in. socket, as shown, install a new conical washer over the diaphragm cover and tap until the washer is flat in the main body. Noting the scribe marks on the throttle plate and main body, install the throttle shaft and lever and the throttle plate. The screws retaining the throttle plate on its shaft should be snug, but not tight. Close the throttle plate, turn the main body upside down and check to ensure that little or no light shows between the plate and bore when the body is held up to the light. Tap the plate lightly in order to ensure that it is seated. Hold the plate closed and tighten and stake the retaining screws. (When securing the screws, use a block of wood to support the shaft and plate in order to avoid damage to or bending of the plate or shaft.)

Assemble the accelerating pump connector link to the throttle link and install the retaining clip. Engage the accelerating pump arm with the pump plunger and position the pump arm return spring over the plastic sleeve. Position the lower tang of the spring into the groove in the main body, then install the pump arm retainer and the carburetor identification tag. Hook the upper end of the spring under the arm near the plunger. Install the choke shaft and choke plate. The hole in the choke plate should be on the lower edge and the plate retaining screws should not be tightened fully until the plate has been centered by tapping it lightly. Assemble the fast idle connector rod to the fork lever and crimp the forked ends of the lever to secure it to the choke shaft. Assemble the lower end of the fast idle connector rod to the slot in the fast idle cam and install the cam along with its plastic collar and retainer. Install the choke piston link to the choke piston lever and slide the piston into the vacuum cylinder in the choke housing, then attach the choke link to the choke lever. With the lever positioned on the end of the choke shaft, secure with the retaining screw. Ensure that the choke linkage has freedom of movement and that it does not bind in any position. Install the choke housing gasket and housing. Install the idle speed and mixture adjusting screws and their springs. The idle mixture adjustment limiter should be installed only after the air-fuel ratio has been adjusted with the engine at normal operating temperature. With the body inverted, install the needle valve components and the float assembly. Check the float level and adjust if necessary. Using a new gasket, install the fuel bowl. Replace the anti-stall dashpot or solenoid and bracket to the carburetor.

2100D

Disassembly

1. Remove the air cleaner anchor screw and the automatic choke control rod retainer.
2. Remove the airhorn attaching screws, lockwashers, and the carburetor identification tag. Remove the airhorn and discard the old gasket.
3. Remove the choke control rod by loosening the screw securing the choke shaft lever to the choke shaft. Remove the rod from the airhorn and slide the plastic dust seal out of the air horn.
4. Remove the choke diaphragm assembly. If it is necessary to remove the choke plate, remove the staking marks on the choke plate attaching screws and remove the screws. Remove the choke plate by sliding it out of the shaft from the top of the airhorn. Slide the choke shaft out of the airhorn.
5. Remove the fast idle cam retainer, thermostatic choke spring housing screws, and then remove the clamp, housing and gasket.
6. Remove the choke housing assembly retaining screws. Remove the choke housing assembly, gasket, and the fast idle cam and rod from the fast idle cam lever. Remove the choke lever retaining screw and washer. Disconnect the staged choke control rod from the choke lever. Remove the choke lever and fast idle cam lever from the choke housing.
7. Using a screwdriver, pry the float shaft retainer from the fuel inlet seat. Remove the float, float shaft retainer, and fuel inlet needle assembly. Remove the retainer and float shaft from the float lever.
8. Remove the fuel inlet needle, seat, filter screen and main jets.
9. Remove the booster venturi screw (accelerator pump discharge), air distribution plate, booster venturi and gasket. Invert the main body and catch the accelerator pump discharge weight and ball in hand.
10. Remove the accelerator pump operating rod from the overtravel lever and retainer by pressing the ends of the retainer together, while simultaneously pressing the rod away from the retainer until it is free. Remove the rod and retainer.
11. Remove the accelerator pump cover retaining screws, pump cover, diaphragm assembly and spring.
12. If it is found necessary to remove the Elastomer valve (power valve), grasp it firmly and withdraw it. If the tip of the valve breaks off during removal, be sure to remove it from the fuel bowl. The Elas-


IAPHRAGM LINK
COVER
DIAPHRAGM ASSEMBLY
SPRING
AIR HORN
CHOKE PLATE
CHOKE PLATE SHAFT
CHOKE PLATE LEVER
HOKE CLEAN AIR TUBE
GASKET
FLOAT SH
DUST SHIELD
CHOKF PLATE ROD
FLOAT
SHAFT RETAINER
RETAINER
MAIN JETS
MAIN BODY
FUEL INLET NEEDLE
FUEL INLET NEEDLE SEAT
FILTER SCREEN
SOI NOID OFF IDLE
HC ENGINE) SPEED
AD. ISTING SCREW
SPRING
CHOKE LEVER
FAST IDLE CAM ADJUSTING SCREW
FAST IDLE CAM LEVER
FAST IDLE CAM ROD
3
3
RETAINER
GASKET
THERMOSTATIC SPRING HOUSING
CLAMP
FAST IDLE CAM
CHOKE HOUSING
CHOKE LEVER
GASKET
POWER VALVE
GASKET
COVER
FAST IDLE ADJUSTING LEVER
BOOSTER VENTURI SCREW
AIR DISTRIBUTION PLATE
ACCELERATING PUMP DISCHARGE BALL CHECK
WEIGHT
NOZZLE BAR AND BOOSTER VENTURI ASSEMBLY
GASKET
MAIN BODY
RETURN SPRING
VALVE
ACCELERATING PUMP OVER-TRAVEL LEVER
ACCELERATING PUMP DIAPHRAGM
SPRING
SCREW
IDLE MIXTURE NEEDLE
THROTTLE PLATES
ACCELERATING PUMP COVER
IDLE LIMITER CAPS
THROTTLE SHAFT AND LEVER ASSEMBLY
ACCELERATING PUMP ROD
ACCELERATING PUMP OVER-TRAVEL SPRING

Motorcraft 2100D-2V Carburetor Disassembled

tomer valve (power valve) must be replaced whenever it is removed from the carburetor.

13. Invert the main body and remove the power valve cover and gasket. Using a box wrench, remove the power valve. Remove and discard the gasket.

14. Remove the idle fuel mixture adjusting screws (needles) and springs. Remove the limiters from the adjusting screws. If necessary, remove the nut and washer securing the fast idle adjusting lever assembly to the throttle shaft and remove the lever assembly. If necessary, remove the idle screw and retainer from the fast idle adjusting lever.

15. Remove the anti-stall dashpot or throttle solenoid (if so equipped).

16. If it is found necessary to remove the throttle plate(s), lightly scribe the outline of the throttle shaft on the throttle plate(s). Mark each plate and its corresponding bore for proper reassembly. Slide the throttle shaft out of the main body.

Assembly

1. Clean all parts, except the accelerator pump diaphragm, power valve, secondary operating diaphragm, anti-stall dashpot, throttle solenoid (if so equipped), and electric choke (if so equipped) in carburetor solvent. Check all parts for wear, damage, nicks, burrs, or traces of foreign material. Clean all mating gasket surfaces. Blow out all passages with compressed air. Compare the new gaskets with the old ones to make sure that all holes in the new gaskets have been properly punched. Make sure that the accelerator pump diaphragm is not torn or cut.

2. Reverse the disassembly procedure to assemble.

Overhaul—Motorcraft 2150

DISASSEMBLY

To facilitate working on the carburetor, and to prevent damage to the throttle plates, install carburetor legs on the base. If legs are unavailable, install 4 bolts (about 2¼ in. long of the correct diameter) and 8 nuts on the carburetor base.

Use a separate container for the component parts of the various assemblies to facilitate cleaning, inspection and assembly.

The following is a step-by-step sequence of operations for completely overhauling the carburetor. However certain components of the carburetor can be serviced without a complete disassembly of the entire unit. For complete carburetor overhaul, follow all of the steps. To partially overhaul a carburetor or to install a new gasket kit, follow only the applicable steps.

Air Horn

1. Remove the air cleaner anchor screw.
2. Remove the automatic choke control rod retainer.
3. Remove the air horn attaching screws, lockwashers and the carburetor identification tag. Remove the air horn and air horn gasket.
4. Remove the choke control rod by loosening the screws which secure the choke shaft lever to the choke shaft. Remove the rod from the air horn. Slide the plastic dust seal out of the air horn.
5. If it is necessary to remove the choke plate, remove the staking marks on the choke plate attaching screws and remove the screws. Remove the choke plate by sliding it out of the shaft from the top of the air horn. Remove any burrs around screw holes prior to removing the choke shaft out of the air horn.

Choke Pulldown Diaphragm Assembly

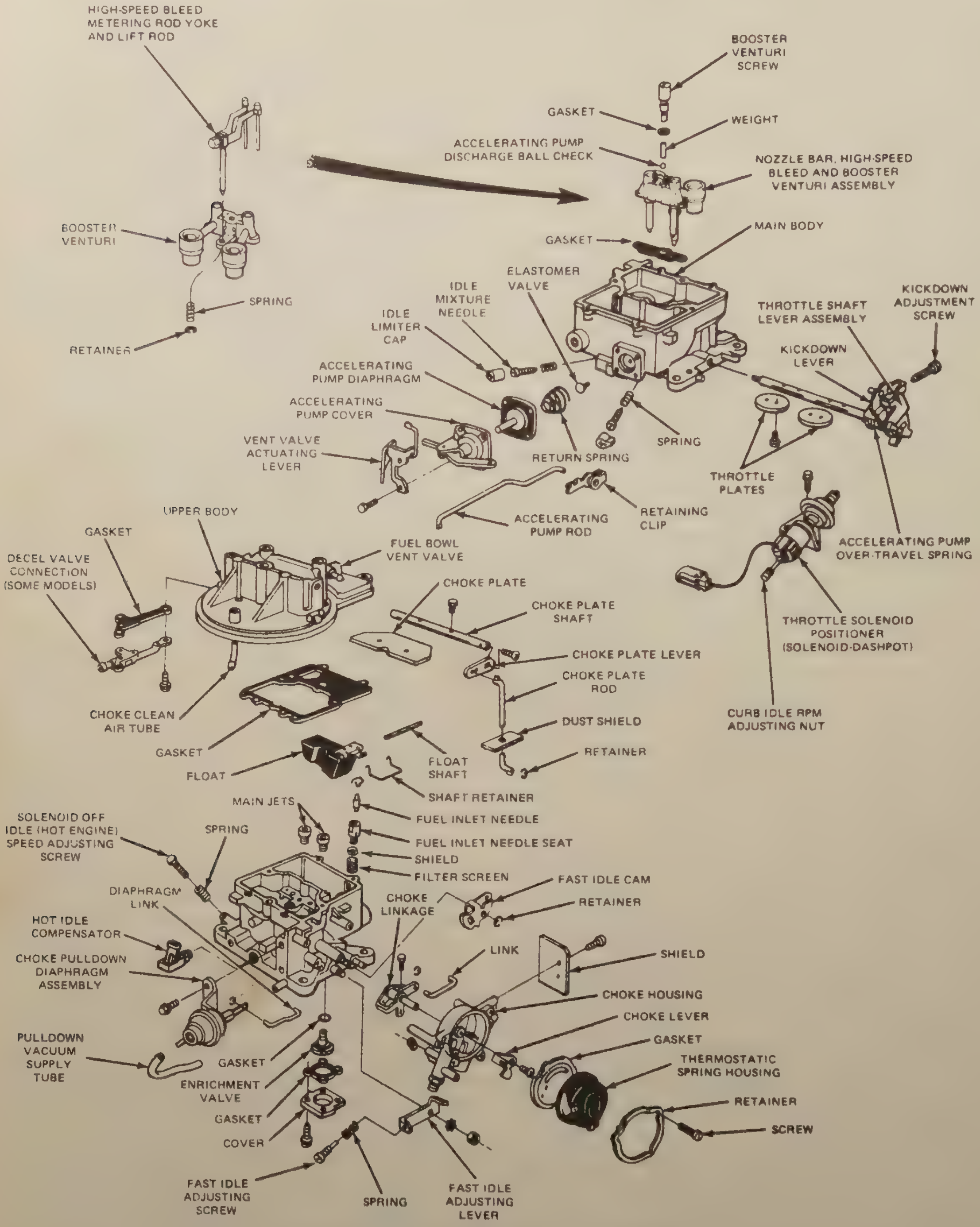
1. Disconnect the choke pulldown link by removing the rod retainer and pulling the rod out of the diaphragm link slot.
2. Remove the two screws from the attaching bracket. Disconnect the vacuum supply tube and remove the pulldown diaphragm.
3. To install, position the choke pulldown diaphragm mounting bracket against the main body casting and install the two attaching screws.
4. Connect the vacuum supply tube to the correct vacuum base tube connection.
5. Insert the choke pulldown control rod through the slot in the diaphragm link. Install the retainer clip over the end of the rod in the slot.
6. Perform an automatic choke pulldown clearance and fast idle cam index setting adjustment as described at the end of this chapter.

Automatic Choke

1. Remove the fast idle cam retainer.
2. Remove the thermostatic choke spring housing retaining screws and remove the clamp, housing and gasket.
3. Remove the choke housing assembly retaining screws. If the air horn was not previously removed, remove the choke control rod retainer. Remove the choke housing assembly, gasket and the fast idle cam rod from the fast idle cam lever.
4. Remove the choke lever retaining screw and washer. Disconnect the choke control rod from the choke lever. Remove the choke lever and fast idle cam lever from the choke housing.

Main Body

1. With the use of screwdriver, pry the float retainer from the fuel inlet seat. Remove the float, float shaft retainer and fuel inlet needle assembly. Remove the retainer and float shaft from the float lever.
2. Remove the fuel inlet needle, seat, filter screen, and main jets with a jet wrench.
3. Remove the booster venturi screw (accelerator pump discharge), air distribution plate, booster venturi and metering rod assembly and gasket. Invert the main body. Let the accelerating pump discharge weight and ball and the mechanical high speed bleed lift rod and spring fall into your hand.
4. Remove the accelerator pump operating rod from the overtravel lever to the retainer. To release the operating rod from the overtravel lever retainer, press upward on the part of the retainer which snaps over the rod. Disengage the rod from the retainer and from the overtravel lever. Remove the rod and retainer.
5. Remove the accelerating pump cover attaching screws. Remove the accelerating pump cover, diaphragm assembly and spring.
6. If it is necessary to remove the Elastomer (power) valve, grasp it firmly and pull it out. If the Elastomer valve tip broke off during removal, by sure to remove the tip from the fuel bowl. An Elastomer valve must be replaced whenever it has been removed from the carburetor, as it will dry out and crack.
7. Invert the main body and remove the enrichment valve with a box wrench or socket wrench. Remove the enrichment valve gasket. Discard the gasket.
8. Remove the idle fuel mixture adjusting screws (needles) and the springs. Re-


HIGH-SPEED BLEED METERING ROD YOKE AND LIFT ROD
BOOSTER VENTURI SCREW
GASKET
WEIGHT
ACCELERATING PUMP DISCHARGE BALL CHECK
NOZZLE BAR, HIGH-SPEED BLEED AND BOOSTER VENTURI ASSEMBLY
BOOSTER VENTURI
GASKET
MAIN BODY
ELASTOMER VALVE
IDLE MIXTURE NEEDLE
SPRING
IDLE LIMITER CAP
KICKDOWN ADJUSTMENT SCREW
THROTTLE SHAFT LEVER ASSEMBLY
KICKDOWN LEVER
RETAINER
ACCELERATING PUMP DIAPHRAGM
ACCELERATING PUMP COVER
VENT VALVE ACTUATING LEVER
SPRING
RETURN SPRING
THROTTLE PLATES
RETAINING CLIP
ACCELERATING PUMP ROD
UPPER BODY
GASKET
FUEL BOWL VENT VALVE
ACCELERATING PUMP OVER-TRAVEL SPRING
DECEL VALVE CONNECTION (SOME MODELS)
CHOKE PLATE
CHOKE PLATE SHAFT
THROTTLE SOLENOID POSITIONER (SOLENOID-DASHPOT)
CHOKE PLATE LEVER
CHOKE PLATE ROD
CHOKE CLEAN AIR TUBE
CURB IDLE RPM ADJUSTING NUT
DUST SHIELD
GASKET
RETAINER
FLOAT
FLOAT SHAFT
SHAFT RETAINER
MAIN JETS
SOLENOID OFF IDLE (HOT ENGINE) SPEED ADJUSTING SCREW
SPRING
FUEL INLET NEEDLE
FUEL INLET NEEDLE SEAT
SHIELD
FILTER SCREEN
FAST IDLE CAM
DIAPHRAGM LINK
CHOKE LINKAGE
RETAINER
HOT IDLE COMPENSATOR
CHOKE PULLDOWN DIAPHRAGM ASSEMBLY
LINK
SHIELD
CHOKE HOUSING
CHOKE LEVER
GASKET
PULLDOWN VACUUM SUPPLY TUBE
GASKET
ENRICHMENT VALVE
THERMOSTATIC SPRING HOUSING
GASKET
RETAINER
COVER
SCREW
FAST IDLE ADJUSTING SCREW
SPRING
FAST IDLE ADJUSTING LEVER

Motorcraft 2150-2V Carburetor Disassembled

move the limiters from the adjusting screws.

9. If necessary remove the nut and washer securing the fast idle adjusting lever assembly to the throttle shaft and remove the lever assembly. If necessary, remove the idle screw and the retainer from the fast idle adjusting lever.

10. Remove the anti-stall dashpot, solenoid, or solenoid-dashpot (if so equipped).

11. If it is necessary to remove the throttle plates, lightly scribe the throttle plates along the throttle shaft, and mark each plate and its corresponding bore with a number or letter for proper installation.

12. Slide the throttle shaft out of the

main body making sure that you catch the mechanical high speed bleed actuator located on the throttle shaft between the throttle plates.

Clean and inspect the carburetor components.

Assembly

Make sure that all holes in new gaskets have been properly punched and that no foreign material has adhered to the gaskets. Make sure that the accelerating pump diaphragm is not torn or cut.

Main Body

1. Slide the throttle shaft assembly into the main body until it begins to enter the high speed bleed cam slot in the body.
2. Holding the cam by the edge of the point, hold it in the slot and rotate the throttle shaft until it will pass through the cam. Rotate the shaft clockwise until the throttle lever clears the boss for the TSP "Off" idle speed screw. Continue inserting the shaft into proper position, rotating as necessary to properly position the cam.
3. Refer to the lines scribed on the throttle plates and install the throttle plates in their proper location with the screws snug, but not tight. Always use new screws when installing throttle plates.
4. Close the throttle plates. Invert the main body, and hold it up to the light. Little or no light should show between the throttle plates and the throttle bores. Tap the plates lightly with a screwdriver handle to seat them. Hold the throttle plates closed and tighten and stake the attaching screws. Stake hardened screws by crimping the exposed threads with diagonal cutters.
5. If necessary, install the fast idle screw on the fast idle adjusting lever.
6. Install the anti-stall dashpot, solenoid, or solenoid-dashpot (if so equipped).
7. Place the fast idle adjusting lever assembly on the throttle shaft and install the retaining washer and nut.
8. If the Elastomer power valve was removed lubricate the tip of a new Elastomer valve and insert the tip into the accelerator pump cavity center hole. Using a pair of needlenose pliers, reach into the fuel bowl and grasp the valve tip. Pull the valve in until it seats in the pump cavity wall and cut off the tip forward of the retaining shoulder. Revome the tip from the bowl.
9. Install the accelerating pump diaphragm return spring on the boss in the chamber. Insert the diaphragm assembly into position on the main body. Install the cover screws.
10. Insert the accelerating pump operating rod retainer over the specified hole in the overtravel lever. Insert the operating rod through the retainer and the hole in the overtravel lever and snap the retainer down over the rod.
11. Invert the main body. Install the enrichment valve and new gasket with a wrench. Tighten the valve securely.
12. Install the idle mixture adjusting screws (needles) and springs. Turn the needles in gently with your fingers until they just touch the seat, then back them off 1½ turns for a preliminary idle fuel mixture adjustment. Do not install the idle mixture limiters at this time. Install the enrichment valve cover and new gasket. The cover must be installed with the limiter stops on the cover in position to provide a positive stop for the tabs on the idle mixture adjusting screw limiters.
13. Install the main jets and the fuel inlet seat, filter screen, baffle and new gasket. Be sure that the correct jets are installed.
14. Install the fuel inlet needle assembly in the fuel inlet seat.
15. Slide the float shaft into the float lever. Position the float shaft retainer on the float shaft.
16. Insert the float assembly into the fuel bowl and hook the float lever tab under the fuel inlet needle assembly. Insert the float shaft into its guides at the sides of the fuel bowl.
17. With a screwdriver, position the float shaft retainer in the groove on the fuel needle inlet seat. Check the float setting.
18. Drop the accelerating pump discharge ball and weight into the passage in the main body.
19. Position the new booster assembly gasket and the booster venturi assembly in the main body. Install the air distribution plate and the accelerator pump discharge screw. Tighten screw.

Automatic Choke

1. Position the fast idle cam lever on the thermostatic choke shaft and lever assembly. The bottom of the fast idle cam

lever adjusting screw must rest against the tang on the choke lever. Insert the choke lever into the rear of the choke housing. Position the choke lever so that the hole in the lever is to the left side of the choke housing.

2. Install the fast idle cam rod on the fast idle cam lever. Place the fast idle cam on the fast idle cam rod and install the retainer. Place the choke housing vacuum pickup port to main body gasket on the choke housing flange.

3. Position the choke housing on the main body and at the same time, install the fast idle cam on the hub on the main body. Position the gasket and install the choke housing attaching screws. Install the fast idle cam retainer. Install the thermostatic spring housing.

Air Horn

1. If the choke plate shaft was removed, position the shaft in the air horn, then install the choke plate rod on the end of the choke shaft.

2. If the choke plate was removed, insert the choke plate into the choke plate shaft. Install the choke plate screws snug, but not tight. Check for proper plate fit, binding in the air horn and free rotation of the shaft by moving the plate from the closed position to the open position. If necessary, remove the choke plate and grind or file the plate edge where it is binding or scraping on the air horn wall. If the choke plate and shaft moves freely, tighten the choke plate screws while holding the choke in the fully closed position.

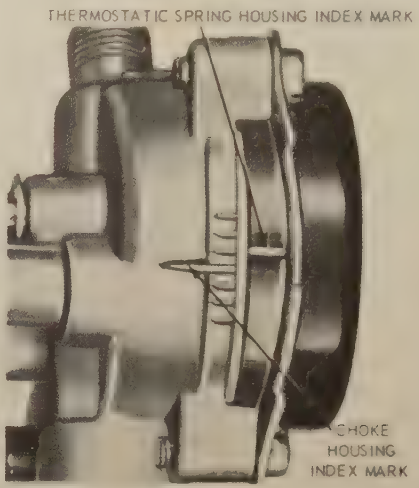
3. Position the main body gasket and the choke rod plastic seal on the main body. Position the air horn on the main body and gasket so that the choke plate rod fits through the seal and the opening in the main body. Insert the end of the choke plate rod into the automatic choke lever. Install the air horn attaching screws and the carburetor identification tag. Tighten the attaching screws. Install the choke plate rod retainer. Install the air cleaner anchor screw. Tighten the air cleaner anchor screw to the specified torque.

Perform all automatic choke adjustments and other carburetor functions to specifications.

Automatic Choke Housing Adjustment

CARTER YF, YFA, RBS, AUTOLITE (MOTORCRAFT) 2100D AND 2150

By rotating the spring housing of the automatic choke, the reaction of the choke to engine temperature can be controlled. To adjust, remove the air cleaner assembly, loosen the thermostatic spring housing retaining screws and set the spring housing to the specified index mark. The marks are shown in the accompanying illustration. After adjusting the setting, tighten the retaining screws and replace the air cleaner assembly to the carburetor.



Automatic Choke Housing Adjustment

Choke Plate Pull-Down Clearance

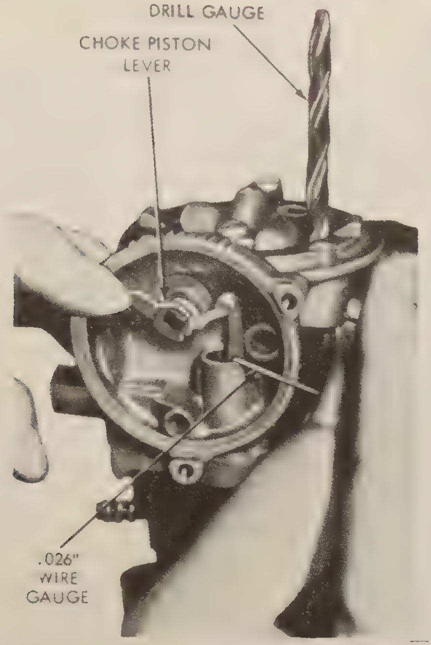
CARTER YF, YFA, AND RBS

1. Remove the carburetor air cleaner, and remove the choke thermostatic spring housing.

2. Bend a section of 0.026 in. diameter wire at a 90° angle approximately ⅛ in. from one end.

3. Insert the bent end of the wire gauge between the choke piston slot and the right-hand slot in the choke housing. Rotate the choke piston lever counterclockwise until the gauge is snug in the piston slot.

4. Exert light pressure upon the choke piston lever to hold the gauge in position. Check the specified clearance with a drill of the correct diameter between the lower edge of the choke plate and the carburetor bore.



Adjusting Choke Plate Pull–Down—Carter YF, YFA, RBS

5. Choke plate pull-down clearance may be adjusted by bending the choke piston lever as required to obtain the desired clearance. It is recommended the choke piston lever be removed prior to bending, in order to prevent distorting the piston link.

6. Install the choke thermostatic spring housing and gasket, and set the housing to the proper specification.

AUTOLITE (MOTORCRAFT) 2100D

1. Remove the air cleaner.
2. With the engine at its normal operating temperature, loosen the choke thermostatic spring housing retaining screws, and set the housing 90° in the rich direction.
3. Disconnect and remove the choke heat tube from the choke housing.
4. Turn the fast idle adjusting screw outward one full turn.
5. Start the engine. Use a drill of the specified diameter to check the clearance between the lower edge of the choke plate and the air horn wall.
6. To adjust the clearance, turn the diaphragm stopscrew (located on the underside of the choke diaphragm housing). Turning clockwise will decrease the clearance; counterclockwise will increase it.
7. Connect the choke heat tube, and set the choke thermostatic spring housing to the proper specification. Adjust the fast idle speed to specifications.

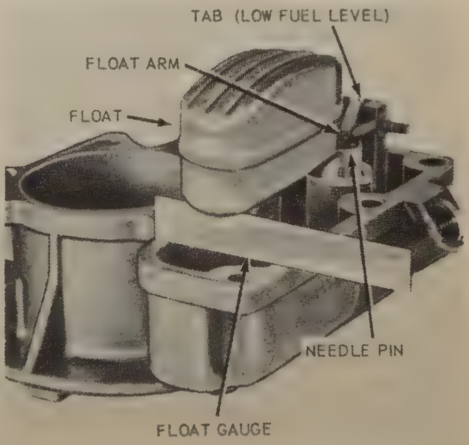
MOTORCRAFT 2150

1. Remove the air cleaner assembly.
2. Set the throttle on the top step of the fast idle cam.
3. Noting the position of the choke housing cap, loosen the retaining screws and rotate the cap 90 degrees in the rich (closing) direction.
4. Activate the pull-down motor by manually forcing the pull-down control diaphragm link in the direction of applied vacuum or by applying vacuum to the external vacuum tube.
5. Using a drill gauge of the specified diameter, measure the clearance between the choke plate and the center of the air horn wall nearest the fuel bowl.
6. To adjust, reset the diaphragm stop on the end of the choke pull-down diaphragm.
7. After adjusting, reset the choke housing cap to the specified notch. Check and reset fast idle speed, if necessary. Install the air cleaner.

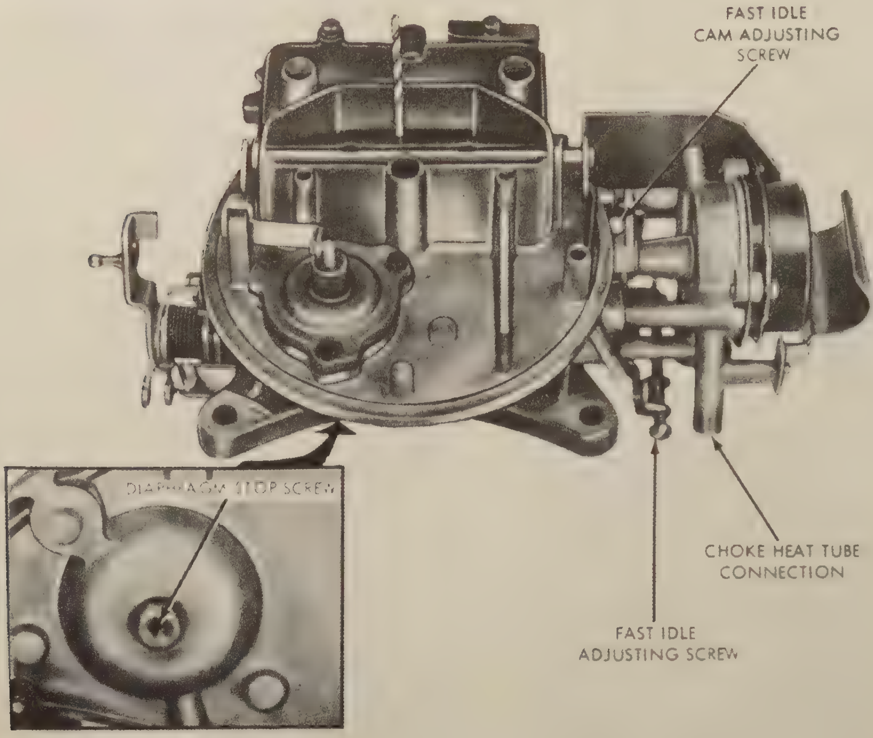
Float Level Adjustment

CARTER YF, YFA

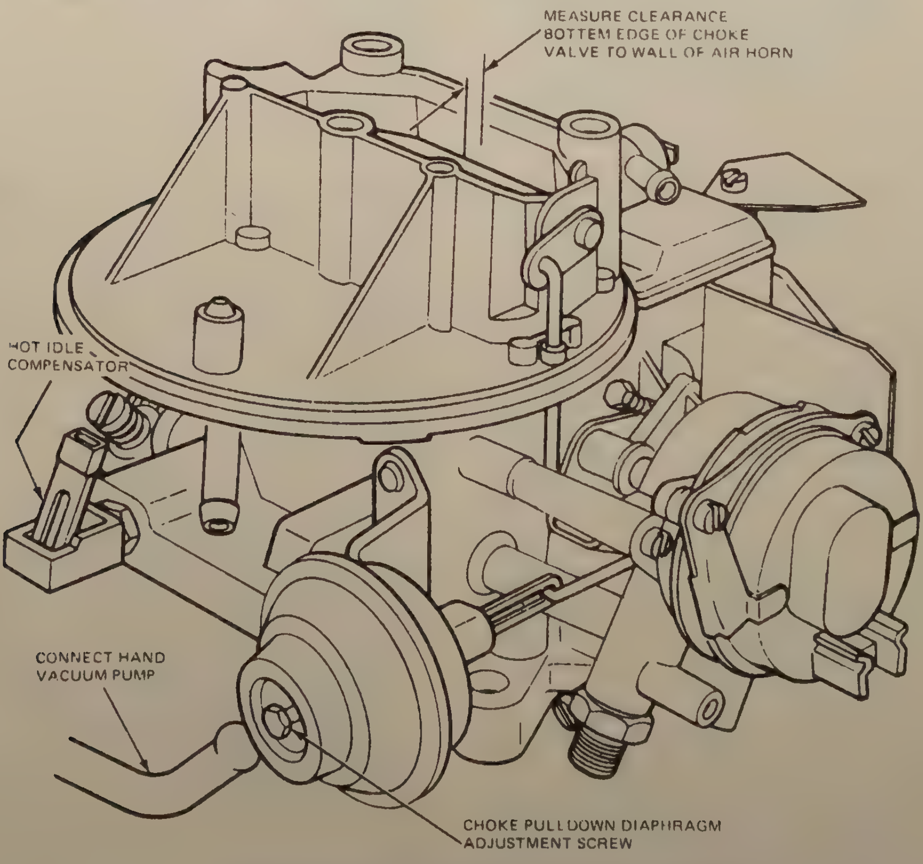
The float level is adjusted dry in the following manner: Remove the carburetor air horn and gasket from the carburetor. Using a gauge made to the proper dimension, invert the air horn assembly and check the clearance between the top of the float and the bottom of the air horn. Float level is



Float Level Adjustment—Carter YF, YFA


FAST IDLE
CAM ADJUSTING
SCREW
DIAPHRAGM STOP SCREW
CHOKE HEAT TUBE
CONNECTION
FAST IDLE
ADJUSTING SCREW

Adjusting Choke Plate Pull-Down—Motorcraft 2100D


MEASURE CLEARANCE
BOTTEM EDGE OF CHOKE
VALVE TO WALL OF AIR HORN
HOT IDLE
COMPENSATOR
CONNECT HAND
VACUUM PUMP
CHOKE PULLDOWN DIAPHRAGM
ADJUSTMENT SCREW

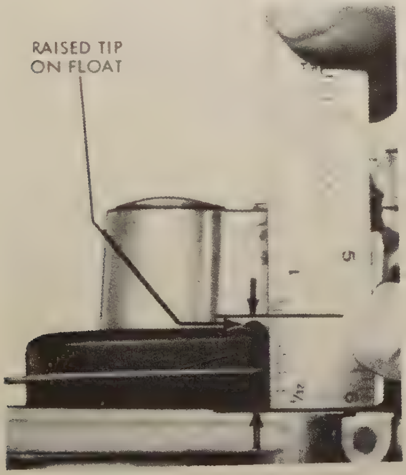
Adjusting Choke Plate Pull-Down—Motorcraft 2150

$\frac{7}{32}$ in. for 1970 models equipped with the 170 six and $\frac{3}{8}$ in. for all other 1970–76 models. When checking the float level, the air horn should be held at eye level and the float lever arm should be resting on the pin of the needle valve. The float lever arm may be bent in order to adjust the float clearance. However, do not bend the tab at the end of the float arm, as this will prevent the float from bottoming in the fuel bowl when the bowl is empty. Using a new gasket, install the carburetor air horn.

CARTER RBS

Remove the fuel bowl and gasket and invert the main body. With only the weight of the float assembly pressing against the needle and seat, measure the vertical distance between the main body casting and the raised tips in the outer ends of the float as shown in the accompanying illustration.

NOTE: *The measurement should be made at both ends of the float, and should be $\frac{9}{16}$ in.*



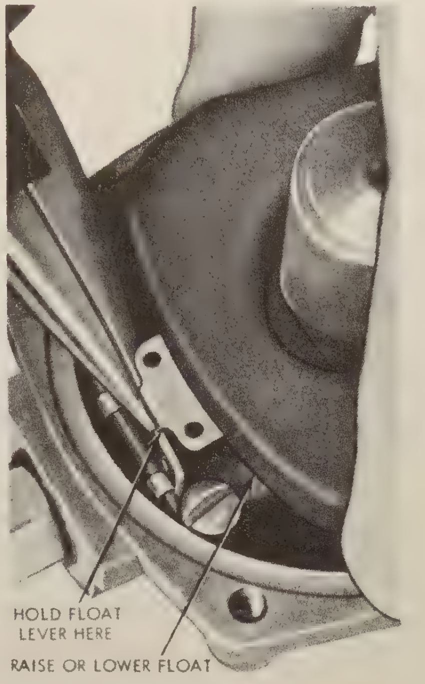
Float Level Adjustment—Carter RBS

If necessary, the measurements may be equalized by holding the float lever as shown and twisting the float as required. When the float level is being adjusted, hold the tab of the float lever away from the needle valve.

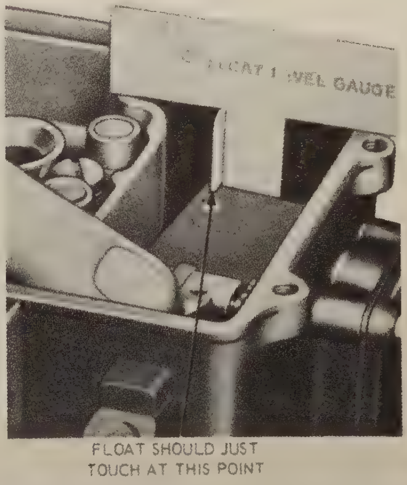
AUTOLITE (MOTORCRAFT) 2100D, 2150

Dry Adjustment

This preliminary setting of the float level adjustment must be done with the carburetor removed from the engine.



Adjusting Float Level—Carter RBS



Dry Float Level Adjustment—Motorcraft 2100D, 2150

1. Remove the air horn and see that the float is raised and the fuel inlet needle is seated. Check the distance between the top surface of the main body (with the gasket removed) and the top surface of the float. Depress the float tab to seat the fuel inlet needle. Take a measurement near the center of the float, at a point $\frac{1}{8}$ in. from the free end. If you are using a prefabricated float gauge, place the gauge in the corner of the enlarged end section of the fuel

bowl. The gauge should touch the float near the end, but not on the end radius.

2. If necessary, bend the tab on the end of the float to bring the setting within the specified limits.

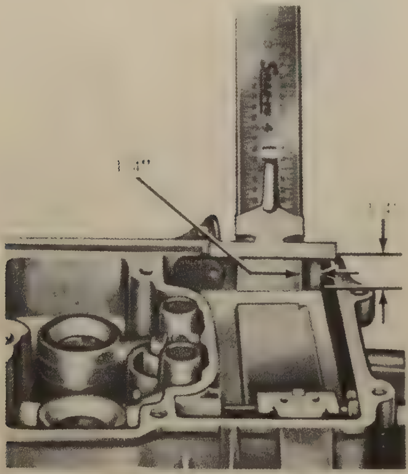
Wet Adjustment

1. Bring the engine to its normal operating temperature, park the car on as nearly level a surface as possible, and stop the engine.

2. Remove the air cleaner assembly from the carburetor.

3. Remove the air horn retaining screws and the carburetor identification tag. Leave the air horn and gasket in position on the carburetor main body. Start the engine, let it idle for several minutes, rotate the air horn out of the way, and remove the gasket to provide access to the float assembly.

4. With the engine idling, use a standard depth scale to measure the vertical distance from the top machined surface of the carburetor main body to the level of the fuel in the fuel bowl. This measurement must be made at least ¼ in. away from any vertical surface in order to assure an accurate reading.



Wet Float Level Adjustment—Motorcraft 2100D, 2150

5. Stop the engine before making any adjustment to the float level. Adjustment is accomplished by bending the float tab (which contacts the fuel inlet valve) up or down as required to raise or lower the fuel level. After making an adjustment, start the engine, and allow it to idle for several minutes before repeating the fuel level check. Repeat as necessary until the proper fuel level is attained.

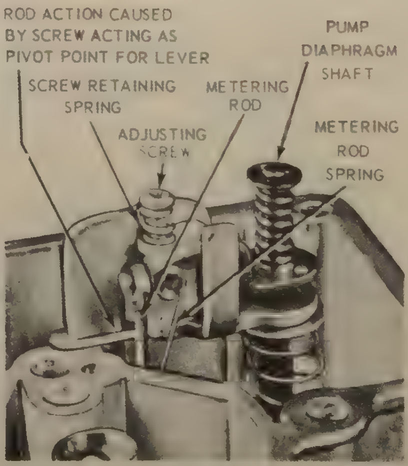
6. Reinstall the air horn with a new gasket and secure it with the screws. Include the installation of the identification tag in its proper location.

7. Check the idle speed, fuel mixture, and dashpot adjustments. Install the air cleaner assembly.

Metering Rod Adjustment

CARTER YF, YFA

With the carburetor air horn and gasket removed from the carburetor, unscrew the idle speed adjusting screw until the throttle plate is tightly closed in the throttle bore. Press downward on the end of the diaphragm shaft until the metering rod arm contacts the lifter link at the diaphragm stem. With the metering rod in the preceding position, turn the rod adjustment screw (see accompanying illustration) until the metering rod just bottoms in the body casting. Turn the metering rod adjusting screw one additional turn in the clockwise direction. Install the carburetor air horn along with a new gasket.



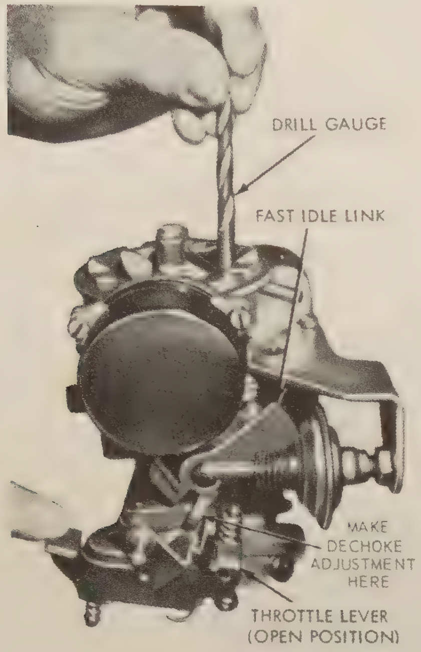
Metering Rod Adjustment—Carter YF, YFA

Dechoke Clearance Adjustment

CARTER YF, YFA

1. Remove the carburetor air cleaner.

2. Hold the throttle plate to the full open position while closing the choke plate as far as possible without forcing it. Use a drill of the proper diameter (see Specifica-



Dechoke Clearance Adustment—Carter YF, YFA

tions) to check the clearance between the choke plate and air horn.

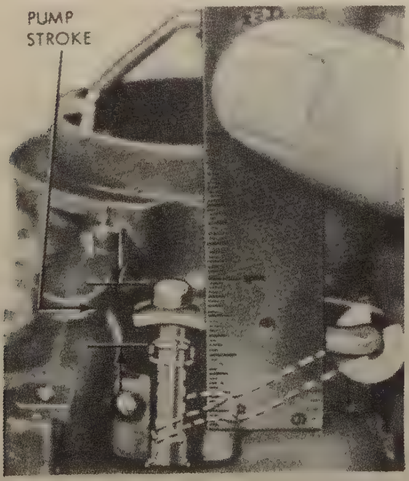
CARTER RBS

The procedure for doing this on the Carter YF carburetor also applies to this type, except that the adjustment is accomplished by bending the tang on the throttle lever.

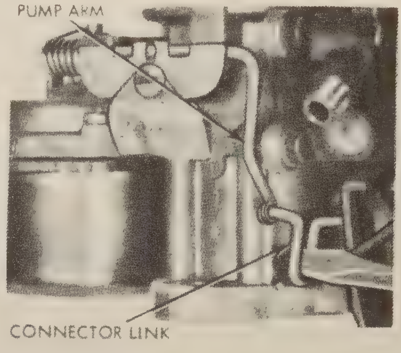
Accelerator Pump Stroke Adjustment

CARTER RBS

Unscrew the idle speed adjusting screw and open the choke plate so that the throttle plate is seated in its bore. Measure the distance between the flat surface of the main body casting and the top surface of the accelerating pump stem, as shown in the accompanying illustration. With the throttle in the wide-open position, measure the height again. The pump stroke is the difference between the first measurement and the second, and should be .400 in. The pump stroke may be adjusted by opening or closing the pump connector link at the offset portion as shown.



Accelerator Pump Stroke Measurement—Carter RBS



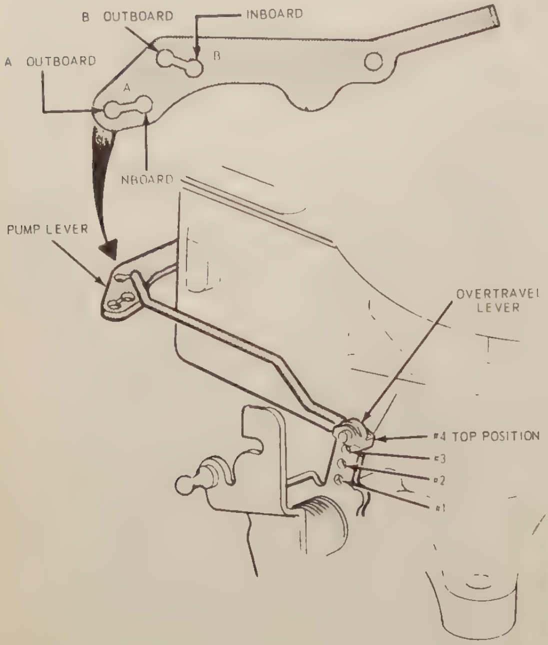
Adjusting Accelerator Pump Stroke—Carter RBS

AUTOLITE (MOTORCRAFT) 2100D, 2150

In order to keep the exhaust emission level of the engine within the specified limits, the accelerating pump stroke has been preset at the factory. The additional holes are provided for differing engine-transmission-body applications only. The primary throttle shaft lever (overtravel lever) has 4 holes and the accelerating pump link 2 holes to control the pump stroke. The accelerating pump operating rod should be in the overtravel lever hole number listed in the "Carburetor Adjustments" specifications table, and in the inboard hole (hole closest to the pump plunger) in the accelerating pump link. If the pump stroke has been changed from the specified settings, use the following procedure to correct the stroke.

1. Release the operating rod from the retaining clip by pressing the tab end of the clip toward the rod while pressing the rod away from the clip until it disengages.

2. Position the clip over the specified hole (see "Carburetor Adjustments" specifications table) in the overtravel lever. Press the ends of the clip together and insert the operating rod through the clip and the



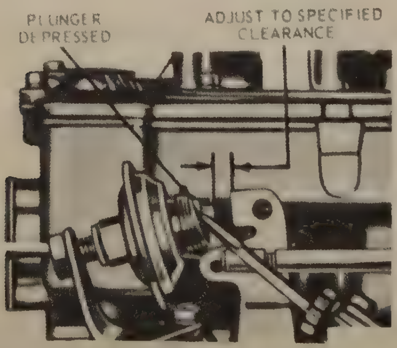
Accelerator Pump Stroke Adjustment—Motorcraft 2100D, 2150

overtravel lever. Release the clip to engage the rod.

Anti-Stall Dashpot Adjustment

ALL CARBURETORS

Having made sure that the engine idle speed and mixture are correct and that the engine is at normal operating temperature, loosen the anti-stall dashpot locking nut (see accompanying illustration). With the throttle held closed, depress the plunger with a screwdriver blade and measure the clearance between the throttle lever and the plunger tip. If the clearance is not as specified in the "Carburetor Adjustments" table, turn the dashpot until the proper clearance is obtained between the throttle lever and the plunger tip. After tightening the locking nut, recheck the adjustment.

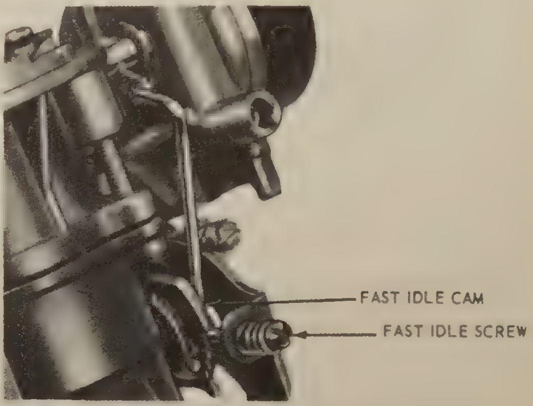


Typical Anti-Stall Dashpot Adjustment

Fast Idle Cam Index Setting

CARTER YF, YFA, AND RBS

1. Position the fast idle screw on the kick-down step of the fast idle cam against the shoulder of the high step.
2. Adjust by bending the choke plate connecting rod to obtain the specified clearance between the lower edge of the choke plate and the carburetor bore.

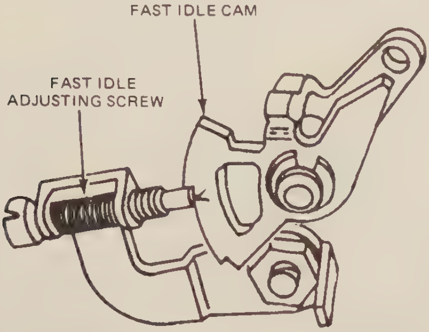


Fast Idle Cam Index Setting—Carter YF, RBS

AUTOLITE (MOTORCRAFT) 2100D, 2150

1971–72

1. Loosen the choke thermostatic spring housing retaining screws and position the housing 90° in the rich direction.
2. Position the fast idle speed screw at the kick-down step of the fast idle cam. This kick-down step is identified by a small "V" stamped in the side of the casting.
3. Be sure that the fast idle cam is in the kick-down position while checking or adjusting the fast idle cam clearance. Check the clearance between the lower edge of the choke plate and the wall of the air horn by inserting a drill of the specified diameter between them. Adjustment may be accomplished by turning the fast idle cam adjusting screw clockwise to increase or counterclockwise to decrease the clearance.
4. Set the choke thermostatic spring housing to specifications, and adjust the antistall dashpot, idle speed, and fuel mixture.


FAST IDLE CAM
FAST IDLE ADJUSTING SCREW
CONVENTIONAL ONE-PIECE FAST IDLE LEVER

Fast Idle Cam Index Setting—Motorcraft 2100D, 2150

1973–76

1. Loosen the choke thermostatic spring housing retaining screws and rotate the housing 90° in the rich direction.
2. Position the fast idle speed screw or lever on the high step of the cam.
3. Depress the choke pull-down diaphragm against the diaphragm stop screw thereby placing the choke in the pull-down position.
4. While holding the choke pull-down diaphragm depressed, slightly open the throttle and allow the fast idle cam to fall.
5. Close the throttle and check the position of the fast idle cam or lever. When the fast idle cam is adjusted correctly, the screw should contact the "V" mark on the cam. Adjustment is accomplished by rotating the fast idle cam adjusting screw as needed.

Throttle and Downshift Linkage Adjustment

Vehicles With Automatic Transmission

1970

1. Disconnect the throttle return spring.
2. Remove the trunnion and cable at the bellcrank.
3. Hold the transmission linkage in full downshift against the stop.
4. Hold the carburetor throttle lever at wide-open throttle against its stop.
5. Adjust the trunnion at the bellcrank until the ball stud on the shaft and the ball stud receiver on the cable align. Then turn the trunnion one full turn to increase the length.
6. Release the transmission and throttle linkage to the normal free position, and install the return spring.

1971–76

1. Disconnect the throttle return spring.
2. With the throttle shaft lever held in the wide-open throttle (WOT) position, and the downshift (kickdown) rod held downward against the through detent stop, adjust the downshift (kickdown adjusting) screw to provide a 0.050–0.070 in. clearance on 1971–72 models, and a 0.010–0.080 in. clearance on 1973–76 models, between the screw and the throttle shaft lever (arm).
3. Release the carburetor and transmission levers to the free position, and install the return spring.

Carburetor Adjustments

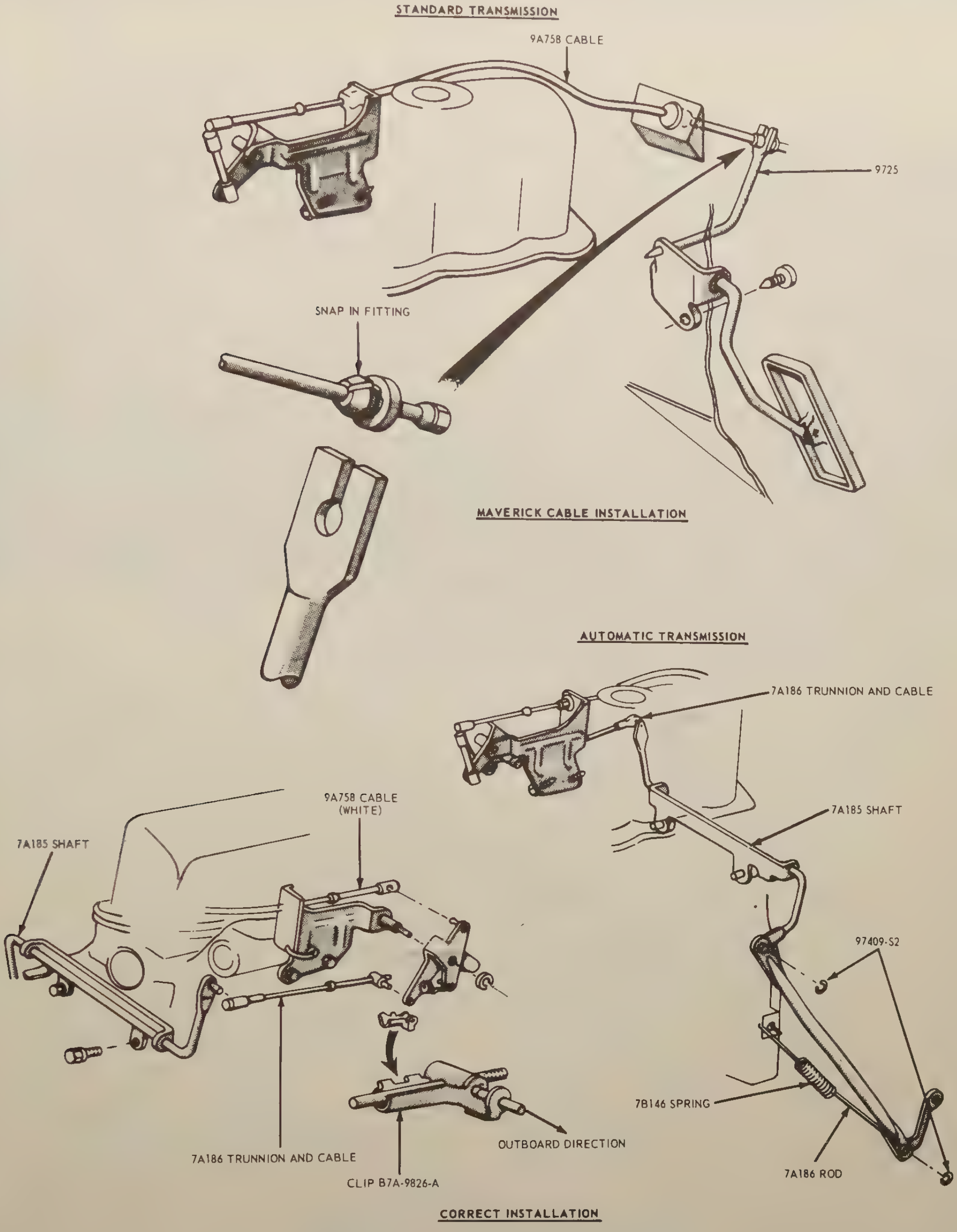
Year	Fuel Float Level Adjustment (in. ± 1/32 in.)	Fast Idle Cam Index Setting (in. ± 1/64 in.)	Anti-stall Dashpot Adjustment (in. ± 1/64 in.)	Choke Plate Pull-down Clearance Adjustment (in. ± 0.0100 in.)	Dechoke Clearance Adjustment (minimum in.)	Automatic Choke Thermostatic Spring Housing Adjustment
Carter YF—IV						
1970	170 eng—7/32 200 eng—3/8		7/64	170 engs—0.225 200 engs—0.265	170 eng—0.28 200 eng—0.25	170 man trans—1-Rich 170 auto trans—Index all 200 eng—Index
1971	3/8	170 man trans—0.105 200 man trans—0.170 200 auto trans—0.140	without A/C 0.100	170 man trans—0.200 200 man trans—0.230 200 auto trans—0.200	170 eng—0.28 200 eng—0.25	Index
1972	3/8	170 man trans—0.105 200 man trans—0.170 200 auto trans—0.140	without A/C 0.100	170 man trans—0.170 200 man trans—0.230 200 auto trans—0.200	170 eng—0.28 200 eng—0.25	170 man trans—Index 200 man trans—Index 200 auto trans—1-Rich
1973	3/8	200 man trans—0.170 200 auto trans—0.140	without A/C 0.100	200 man trans—0.230 200 auto trans—0.200	0.25	200 man trans—Index 200 auto trans—1-Rich
1974	3/8	200 man trans—0.170 200 auto trans—0.140	without A/C 0.100	200 man trans—0.230 200 man trans—0.200	0.25	Index
Carter RBS—IV						
1970	9/16	0.115	without A/C 7/32	0.19	0.25	1-Rich
1971–72	9/16	0.115	None	0.19	0.25	1-Rich
1973	9/16	0.115	None	0.19	0.25	Index
1974	9/16	0.115	None	man trans—9.30 auto trans—0.19	0.25	Index①
Carter YFA—IV						
1975	3/8②	0.140	None	0.290	0.25	200 eng—Index 250 eng—2-Rich
1976	25/32	0.140	None	200 eng—0.260 250 eng—0.290③	0.25	200 49 states—1-Rich 250 49 states—Index 250 California—2-Rich

① Choke cap setting on carburetor D4DE—AAA is 1 lean.
② Float level in 3/4 in on D5DE-NB and D5DE-RB carburetors.
③ Pull-down clearance is 0.230 in. on D6DE-BB carburetor.

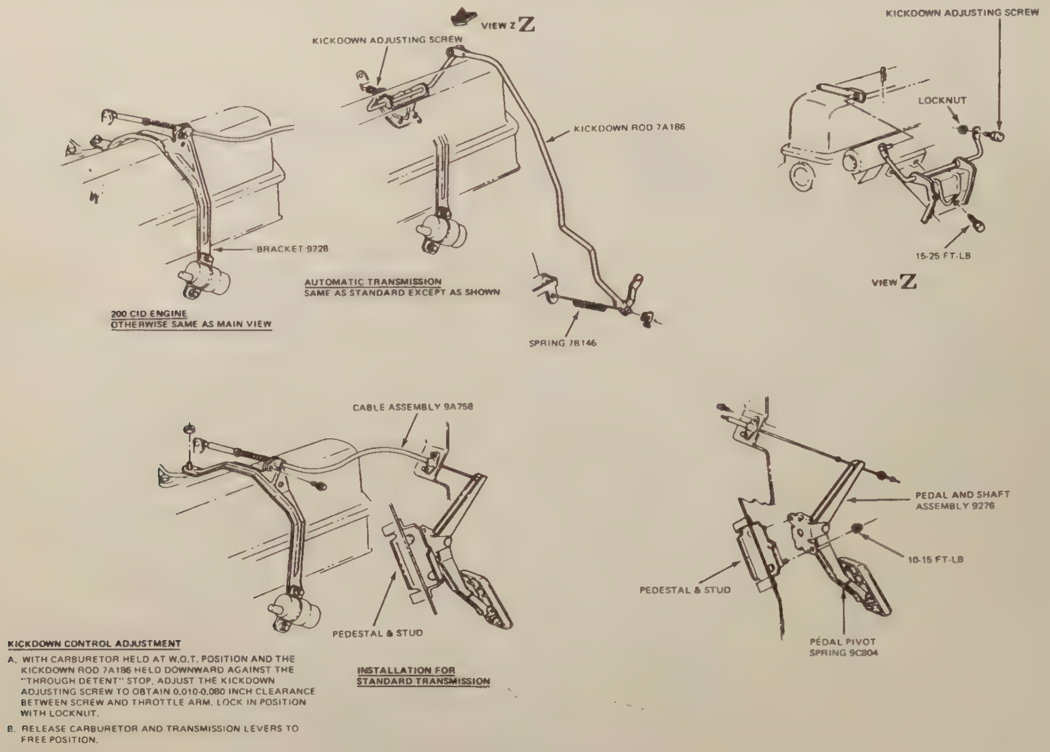
Carburetor Adjustments (cont.)

Year	Fuel Level (in.) Dry	Float Adj (in.) Wet	Fast Idle Cam Index Setting (in.)	Anti-Stall Dashpot Adj. (in.)	Accelerator Pump Operating Rod Position (in overtravel lever)	Automatic Choke Thermostatic Spring Housing Adj	Choke Plate Pull-Down Clearance Adj (in.)
Autolite (Motorcraft) 2100D-2V							
1971	7/16	13/16	man trans—0.150 auto trans—0.130	without A/C auto trans—1/8	man trans—#3 hole auto trans —#2 hole	man trans—1-Rich auto trans—Index	man trans—0.170 auto trans—0.150
1972	7/16	13/16	.0130	without A/C auto trans—1/8	#2A hole	1-Rich	man trans—0.140 auto trans—0.150
1973	7/16	13/16	See Procedure	None	#2A hole	3-Rich	
1974	7/16	13/16	See Procedure	None	#2A hole	3-Rich	0.160①
Motorcraft 2150-2V							
1975	7/16	13/16	See Procedure	None	#2 hole	3-Rich	0.140
1976	7/16	13/16	See Procedure	None	#2 hole	3-Rich	0.140

① Overrich choke setting—increase clearance in steps of 0.020 in.
Lean choke setting—decrease clearance in steps of 0.020 in.


STANDARD TRANSMISSION
9A758 CABLE
9725
SNAP IN FITTING
MAVERICK CABLE INSTALLATION
AUTOMATIC TRANSMISSION
7A186 TRUNNION AND CABLE
7A185 SHAFT
9A758 CABLE
(WHITE)
7A185 SHAFT
97409-S2
7B146 SPRING
7A186 TRUNNION AND CABLE
OUTBOARD DIRECTION
CLIP B7A-9826-A
7A186 ROD
CORRECT INSTALLATION

Throttle and Downshift Linkage—1970

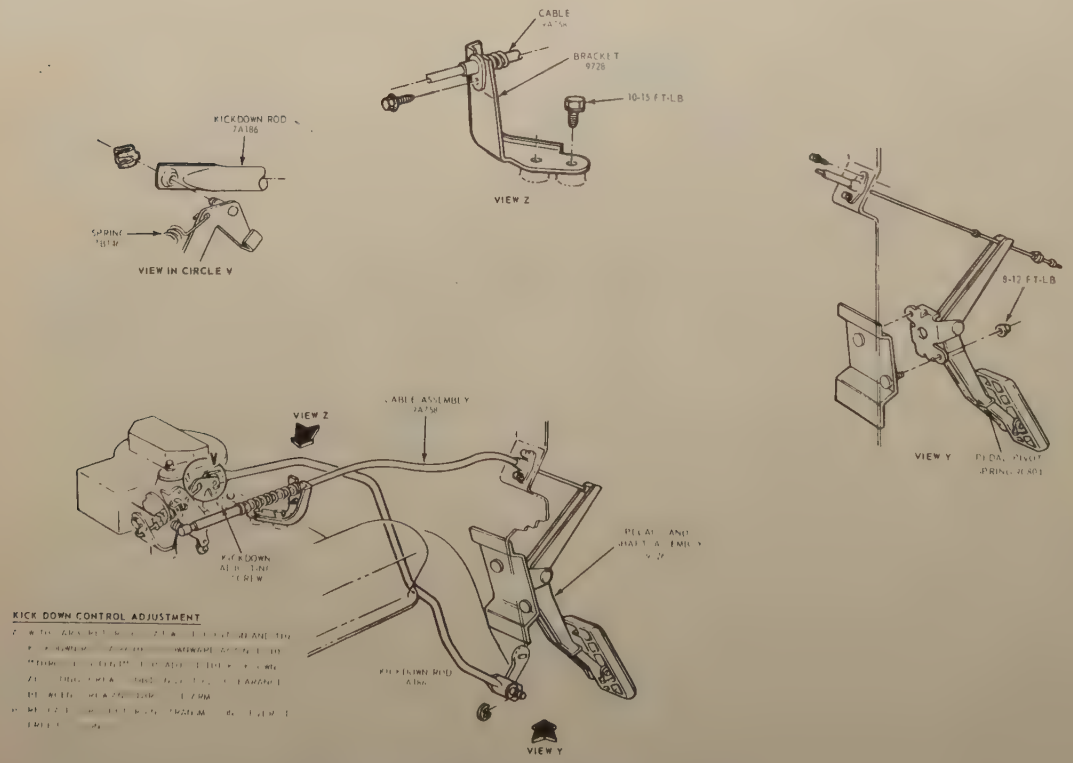

VIEW Z
KICKDOWN ADJUSTING SCREW
KICKDOWN ROD 7A186
BRACKET 9728
AUTOMATIC TRANSMISSION
SAME AS STANDARD EXCEPT AS SHOWN
200 CID ENGINE
OTHERWISE SAME AS MAIN VIEW
SPRING 7B146
KICKDOWN ADJUSTING SCREW
LOCKNUT
15-25 FT-LB
VIEW Z
CABLE ASSEMBLY 9A758
PEDESTAL & STUD
PEDAL AND SHAFT ASSEMBLY 9276
10-15 FT-LB
PEDESTAL & STUD
PEDAL PIVOT SPRING 9C804
INSTALLATION FOR STANDARD TRANSMISSION

KICKDOWN CONTROL ADJUSTMENT

A. WITH CARBURETOR HELD AT W.O.T. POSITION AND THE KICKDOWN ROD 7A186 HELD DOWNWARD AGAINST THE "THROUGH DETENT" STOP, ADJUST THE KICKDOWN ADJUSTING SCREW TO OBTAIN 0.010-0.080 INCH CLEARANCE BETWEEN SCREW AND THROTTLE ARM. LOCK IN POSITION WITH LOCKNUT.

B. RELEASE CARBURETOR AND TRANSMISSION LEVERS TO FREE POSITION.

Six-Cylinder Throttle and Downshift Linkage—1971–76


CABLE 9A758
BRACKET 9728
10-15 FT-LB
VIEW Z
KICKDOWN ROD 7A186
SPRING 7B146
VIEW IN CIRCLE V
9-12 FT-LB
VIEW Y
PEDAL PIVOT SPRING 9C804
VIEW Z
CABLE ASSEMBLY 9A758
KICKDOWN ADJUSTING SCREW
PEDAL AND SHAFT ASSEMBLY
KICKDOWN ROD 7A186
VIEW Y

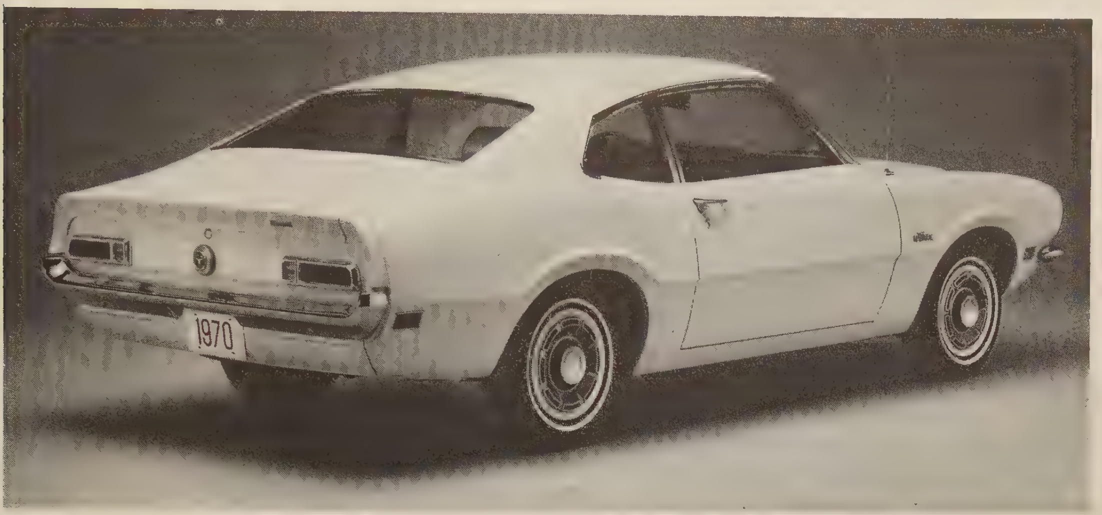
KICK DOWN CONTROL ADJUSTMENT

[illegible]

[illegible]

V8 Throttle and Downshift Linkage—1971–76

5 · Chassis Electrical



Understanding Electrical Systems

For any electrical system to operate there must be a complete circuit. This means that the power flow from the battery must make a complete circle. When an electrical component is operating, power flows from the battery to the component, passes through the component causing the component to perform its function, then returns to the battery through the ground of the circuit. This ground is usually (but not always) the metal part of the car upon which the electrical component is mounted.

Perhaps the easiest way to visualize this is to think of connecting a light bulb, with two wires attached to it, to your car battery. The battery in your car has two posts, negative and positive. If one of the two wires attached to the light bulb was attached to the negative post and the other wire was attached to the positive post, you would have a complete circuit. Current from the battery would flow out one post, through the wire attached to it, and then to the light bulb, causing it to light. It would then leave the light bulb, travel through the other wire and return to the other post of the battery. The normal automotive circuit differs from this simple circuit in two ways. First, instead of having a return wire from the bulb to the battery, the light bulb returns the current to the battery through the chassis of the vehicle. Since the negative battery cable is attached to the chassis and the chassis is made of electrically conductive metal, the chassis of the vehicle can serve as a ground wire to complete the circuit. Secondly, most automotive circuits contain switches to turn components on and off as required.

There are many types of switches, but the most common simply serves to prevent the passage of current when it is turned off. Since the switch is a part of the complete circuit, when the switch is turned off it breaks the circuit.

Some electrical components which require a large amount of current also have a relay in their circuit. A relay is simply an electrically operated switch, operated remotely by a control switch. The purpose of the relay is to avoid the current loss induced by routing the heavy current carrier circuit to the remote switch location. The horn circuit uses a relay.

Did you ever notice how your instrument panel lights get brighter the faster your car goes? That happens because your alternator (which supplies the battery) puts out more current at speeds above idle. This is a very normal thing, however it is possible for larger surges of current to pass through the electrical system of your car. If such a surge were to reach an electrical component it would be burnt out. To prevent this, fuses are connected into the current supply wires of most of the major electrical systems of your car. When an electrical current of more power than a component is designed to operate on tries to pass through that component's fuse, the fuse blows (melts) and breaks the circuit to the component, saving it from destruction.

The fuse also protects the component from damage if the power supply wire to the component is grounded before the current reaches the component. Every complete circuit from a power source must include a component which is using the power. Let's go back to the earlier example of the light bulb with two attached wires being hooked to a battery. If you were to disconnect the light bulb from the wires and touch the two wires together (don't try it), the result would be a display of sparks. A similar thing happens (on a smaller scale) when the power supply wire to a component or the electrical component itself becomes grounded before the normal ground connection for the circuit. To prevent damage to the system, the fuse for the circuit blows to interrupt the circuit and protect the components from damage. Because grounding a wire from a power source makes a complete circuit (less the required component to use the power), this phenomenon is called a short circuit. The most common causes of a short circuit are the insulation on a wire breaking or rubbing through to expose the current carrying core of the wire to the metal parts of the car, or a shorted switch.

Some electrical systems on the car are protected by a circuit breaker. A circuit breaker is basically a self-repairing fuse. When either of the above described events takes place in a system which is protected by a circuit breaker, the circuit breaker opens the circuit in the same way that a fuse does. However, when the short is removed from the circuit or the surge subsides, the circuit breaker resets itself and does not have to be replaced as a fuse does.

Since 1970, all models have incorporated a fuse link in the charging system. The fuse link is a short length of insulated wire, several gauge sizes smaller than the system it protects. The fuse link melts if a booster battery is wired into the system incorrectly, or if a component of the electrical system is shorted to ground. When the fuse link melts, it leaves an open circuit in the charging system and, consequently, the alternator will not charge the battery. A melted fuse link can be identified by bare wire ends or bubbled insulation. It is located in the engine wire harness on or near the starter solenoid, and is marked "fuse link" on 1970–71 models. The procedure for replacing the fuse link is in Chapter 3.

Heater—Vehicles Without Integral Heater-Air Conditioner

HEATER ASSEMBLY

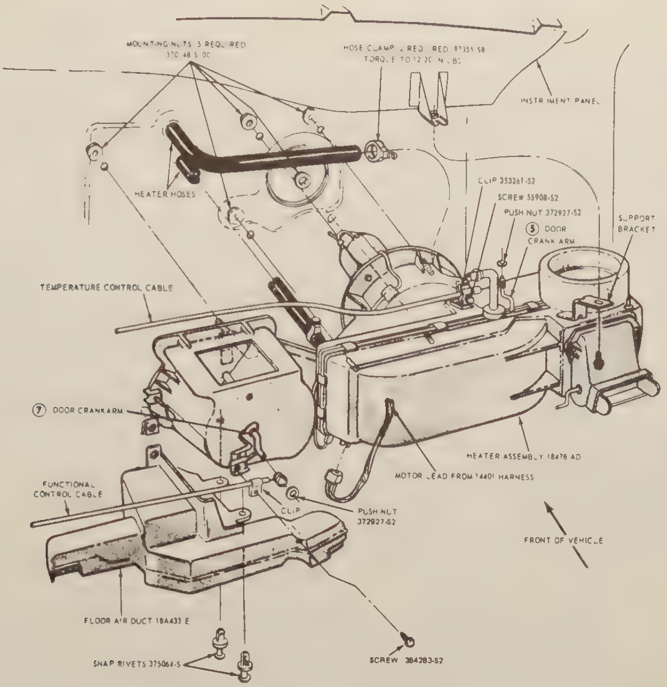
Removal and Installation

1. Drain the cooling system and disconnect the negative battery cable.
2. Disconnect the blower ground wire (black) from the fender apron.
3. Disconnect the heater hoses from the engine block.
4. Remove the five heater assembly-to-firewall attaching bolts from the firewall.
5. Working inside the car, remove the ignition switch and plate from the package tray and remove the tray from the dash.
6. Remove the right kick panel and remove the package tray bracket.
7. Disconnect the heater control cables from the heater.
8. Disconnect the defroster air duct from the top of the heater.
9. Disconnect the heater blower motor lead wires from the resistor at the bottom of the heater.
10. Remove the one screw from the bracket that mounts the heater to the dash.
11. Remove the heater from the car by pulling the heater hoses through the firewall, then disconnecting them from the heater.

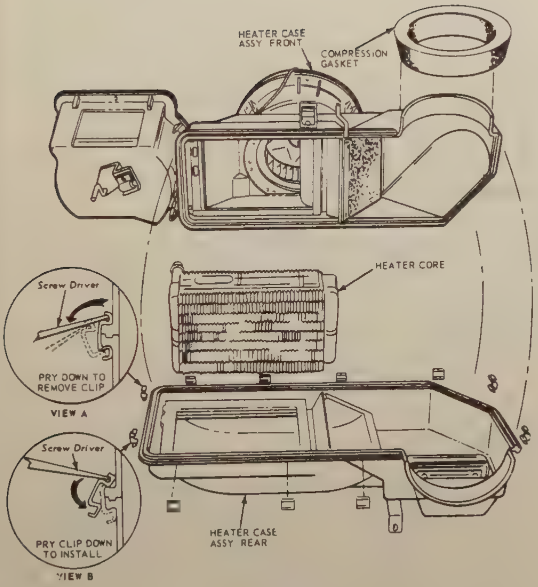
HEATER CORE

Removal and Installation

1. Remove the heater assembly.
2. Remove the air inlet seal from the heater assembly.


MOUNTING NUTS 3 REQUIRED
370 48 S 00
HOSE CLAMP REQUIRED 97355 S8
TORQUE TO 12 20 IN LBS
INSTRUMENT PANEL
HEATER HOSES
CLIP 353261-S2
SCREW 55908-S2
PUSH NUT 372927-S2
⑤ DOOR CRANK ARM
SUPPORT BRACKET
TEMPERATURE CONTROL CABLE
⑦ DOOR CRANKARM
HEATER ASSEMBLY 18478 AD
MOTOR LEAD FROM 14401 HARNESS
FUNCTIONAL CONTROL CABLE
CLIP
PUSH NUT 372927-S2
FRONT OF VEHICLE
FLOOR AIR DUCT 18A433 E
SNAP RIVETS 375064-S
SCREW 384283-S2

Heater Assembly—Non-A/C Cars


HEATER CASE ASSY FRONT
COMPRESSION GASKET
HEATER CORE
Screw Driver
PRY DOWN TO REMOVE CLIP
VIEW A
Screw Driver
PRY CLIP DOWN TO INSTALL
VIEW B
HEATER CASE ASSY REAR

Heater Core Removal—Non-A/C Cars

3. Remove the eleven clips from the heater assembly flange and separate the heater assembly housing.

4. Remove the heater core from the heater assembly housing. Reverse the procedure to install.

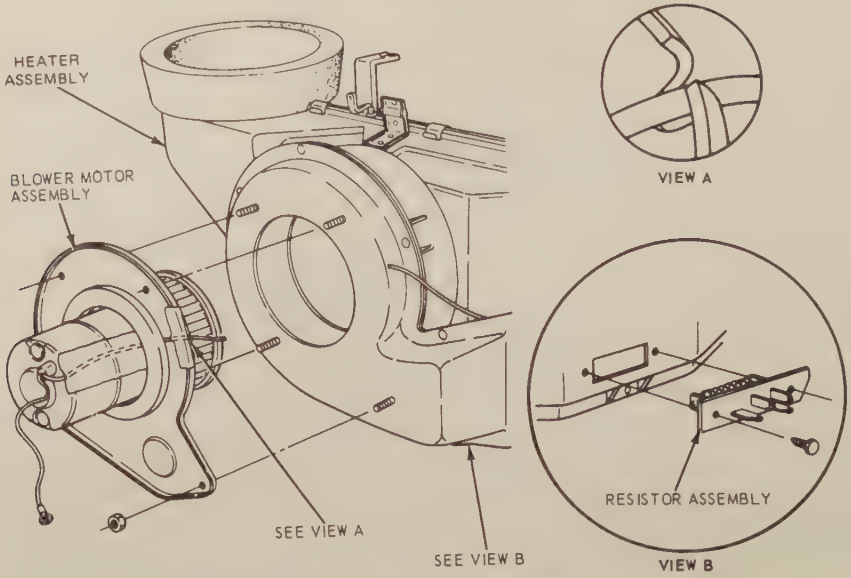
BLOWER MOTOR

Removal and Installation

The blower motor on all models is located inside the heater assembly. To replace the blower motor, remove the heater assembly from the car following the steps in the above procedures. Once the heater assembly is removed, it is a simple operation to remove the motor attaching bolts and remove the motor. On all models, the motor and cage are removed as an assembly.

Heater—Vehicles With Integral Heater-Air Conditioner

NOTE: *Removal of the heater-air conditioner housing requires evacuation of the air conditioner refrigerant. This operation requires special tools and training. Unless you have the equipment needed, it is not recommended that you attempt this job, as improper evacuation of the pressurized refrigerant may result in personal injury.*



Blower Motor and Wheel Assembly Removal—Non-A/C Cars

It is included here for reference purposes only.

HEATER-AIR CONDITIONER HOUSING

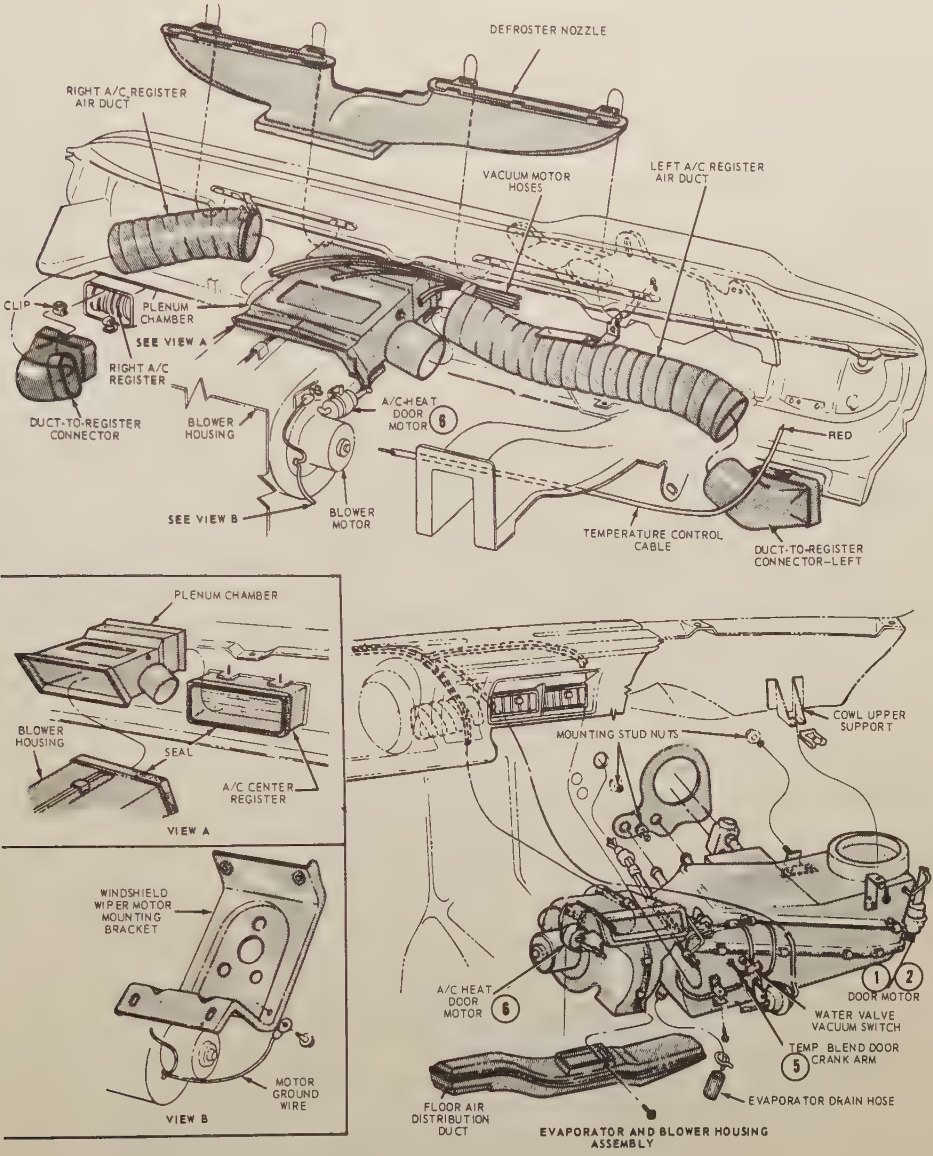
Removal

NOTE: *To facilitate installation, tag vacuum lines and electrical wires, as to their proper location, before disassembling unit. To remove the core, it is necessary to remove the entire evaporator assembly.*

1. Disconnect the battery and remove the air cleaner.
2. Drain the cooling system.
3. Connect a manifold gauge set to the compressor, and discharge the system.
4. Remove the expansion valve and disconnect the heater hoses from the heater core. Tape over openings to avoid entry of dirt.
5. Remove the utility shelf and bracket from the lower edge of the instrument panel, and remove the right cowl trim panel and radio.
6. Disconnect the right and left A/C register air ducts from the plenum chamber.
7. Remove the floor distribution duct from the blower housing.
8. Remove the center register from the instrument panel. Then pull the plenum chamber part way through the register opening to disengage it from the blower housing. Disconnect the (blue) hose from the (7) door motor on the plenum chamber.
9. Disconnect the vacuum hoses from the door motors.
10. Disconnect the vacuum harness multiple connector from the control assembly.
11. Disconnect the temperature control cable from the evaporator housing, and disconnect the vacuum hoses from the adjacent water valve vacuum switch.
12. Move the A/C assembly rearward and away from the dash panel.
13. Remove any remaining hoses and disconnect wires from the blower resistor, the de-icing switch and the blower motor ground wire.
14. Remove the evaporator and blower housing assembly from the vehicle.

Installation

1. Install the assembly into the vehicle by reversing the removal procedures, being careful to correctly connect the vacuum hoses. When making connections to the water valve vacuum switch, connect the purple hose to the nipple closest to the switch plunger and attach the green hose to the water valve motor.
2. After installation, adjust the temperature control cable and, if neccessary, the water valve vacuum switch.
3. Evacuate, leak test and charge the system.


DEFROSTER NOZZLE
RIGHT A/C REGISTER AIR DUCT
VACUUM MOTOR HOSES
LEFT A/C REGISTER AIR DUCT
CLIP
PLENUM CHAMBER
SEE VIEW A
RIGHT A/C REGISTER
DUCT-TO-REGISTER CONNECTOR
BLOWER HOUSING
A/C-HEAT DOOR MOTOR ⑥
RED
SEE VIEW B
BLOWER MOTOR
TEMPERATURE CONTROL CABLE
DUCT-TO-REGISTER CONNECTOR—LEFT
PLENUM CHAMBER
BLOWER HOUSING
SEAL
A/C CENTER REGISTER
VIEW A
WINDSHIELD WIPER MOTOR MOUNTING BRACKET
MOTOR GROUND WIRE
VIEW B
COWL UPPER SUPPORT
MOUNTING STUD NUTS
A/C HEAT DOOR MOTOR ⑥
① ② DOOR MOTOR
WATER VALVE VACUUM SWITCH
TEMP BLEND DOOR CRANK ARM ⑤
EVAPORATOR DRAIN HOSE
FLOOR AIR DISTRIBUTION DUCT
EVAPORATOR AND BLOWER HOUSING ASSEMBLY

Heater—A/C Assembly and Air Ducts

HEATER CORE

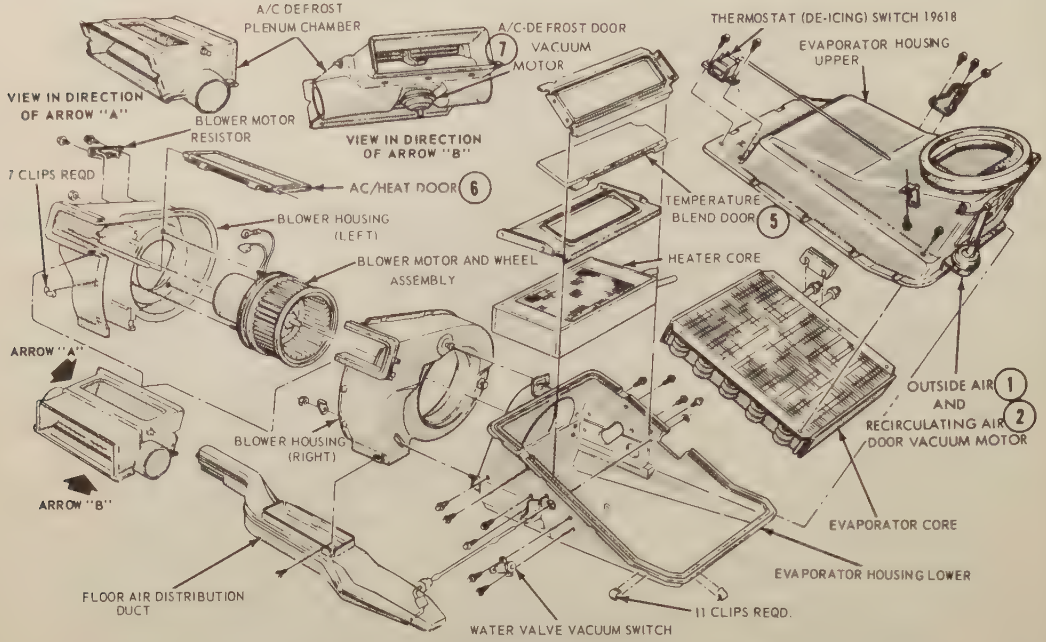
Removal and Installation

1. Remove the heater-air conditioner assembly.
2. Remove the flange clips and upper half of the housing assembly.
3. Remove the water valve vacuum switch from the lower half of the housing.
4. Remove the screw, retaining clip and temperature blend door shaft, the four screws and door upper frame, the door, and the four screws, and door lower frame from the lower half of the housing.
5. Lift the heater core from the lower housing.
6. Transfer the pads from the old core to the new core.
7. Reverse the above procedures to install. Leak-test, evacuate and charge the refrigeration system.

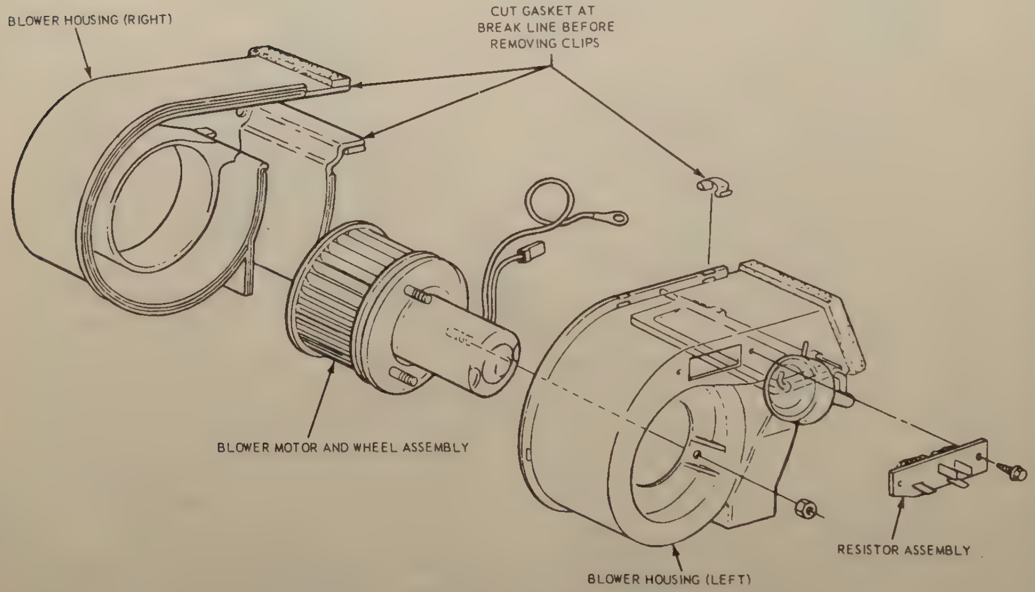
BLOWER MOTOR

Removal

1. Remove the radio assembly.
2. Remove the utility shelf, and air ducts from the plenum chamber.


A/C DEFROST PLENUM CHAMBER
A/C-DEFROST DOOR VACUUM MOTOR ⑦
THERMOSTAT (DE-ICING) SWITCH 19618
EVAPORATOR HOUSING UPPER
VIEW IN DIRECTION OF ARROW "A"
BLOWER MOTOR RESISTOR
VIEW IN DIRECTION OF ARROW "B"
7 CLIPS REQD
AC/HEAT DOOR ⑥
BLOWER HOUSING (LEFT)
TEMPERATURE BLEND DOOR ⑤
BLOWER MOTOR AND WHEEL ASSEMBLY
HEATER CORE
ARROW "A"
OUTSIDE AIR ① AND RECIRCULATING AIR ② DOOR VACUUM MOTOR
BLOWER HOUSING (RIGHT)
ARROW "B"
EVAPORATOR CORE
EVAPORATOR HOUSING LOWER
FLOOR AIR DISTRIBUTION DUCT
11 CLIPS REQD.
WATER VALVE VACUUM SWITCH

Evaporator and Blower Housing Disassembled—1970–73


BLOWER HOUSING (RIGHT)
CUT GASKET AT BREAK LINE BEFORE REMOVING CLIPS
BLOWER MOTOR AND WHEEL ASSEMBLY
RESISTOR ASSEMBLY
BLOWER HOUSING (LEFT)

Blower Motor and Wheel Assembly Removal—A/C Cars

3. Remove the air duct from the bottom of the blower housing.
4. Remove the blower housing mounting stud nut and lock plate.
5. Rotate the blower housing from the evaporator housing.
6. Disconnect the vacuum hoses, resistor and ground wires, and remove the housing.
7. Separate the left and right halves.

Installation

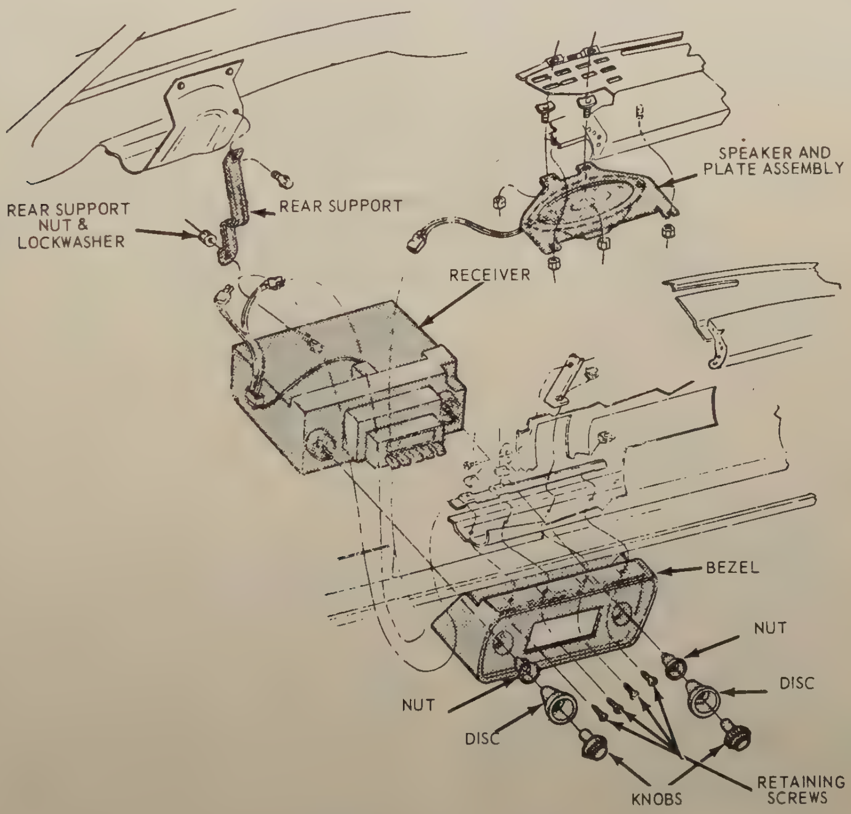
1. Set the motor in place.
2. Install the motor attaching nuts.
3. Set the blower fan on the motor shaft.

4. Install the blower motor and fan assembly.
5. Set the blower housing in place.
6. Install the blower housing attaching nuts, washers, and screws.
7. Install the water valve.

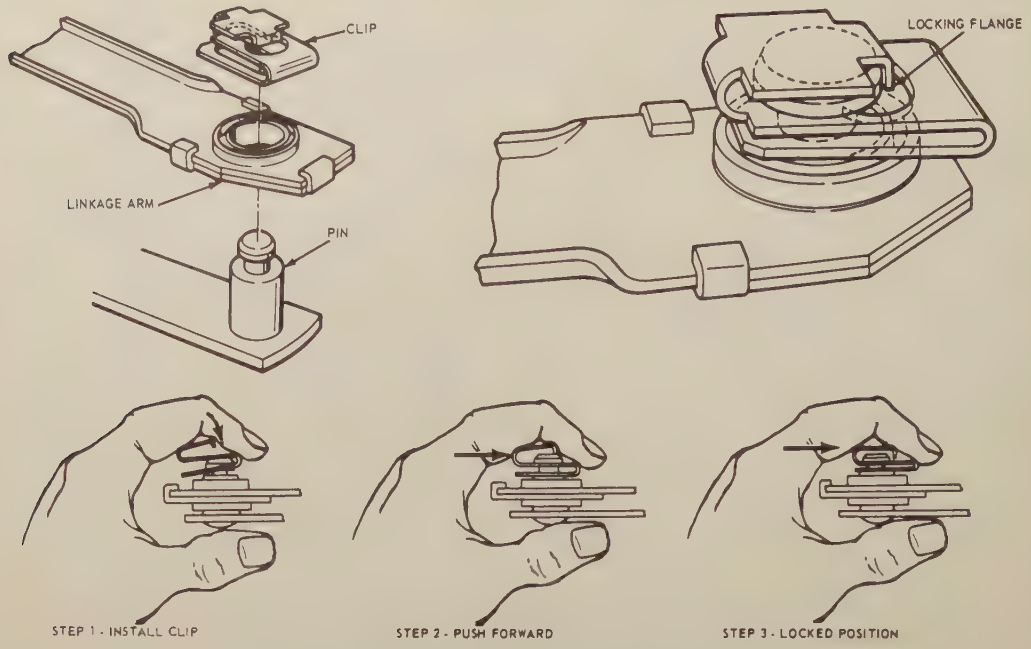
Radio

Removal and Installation

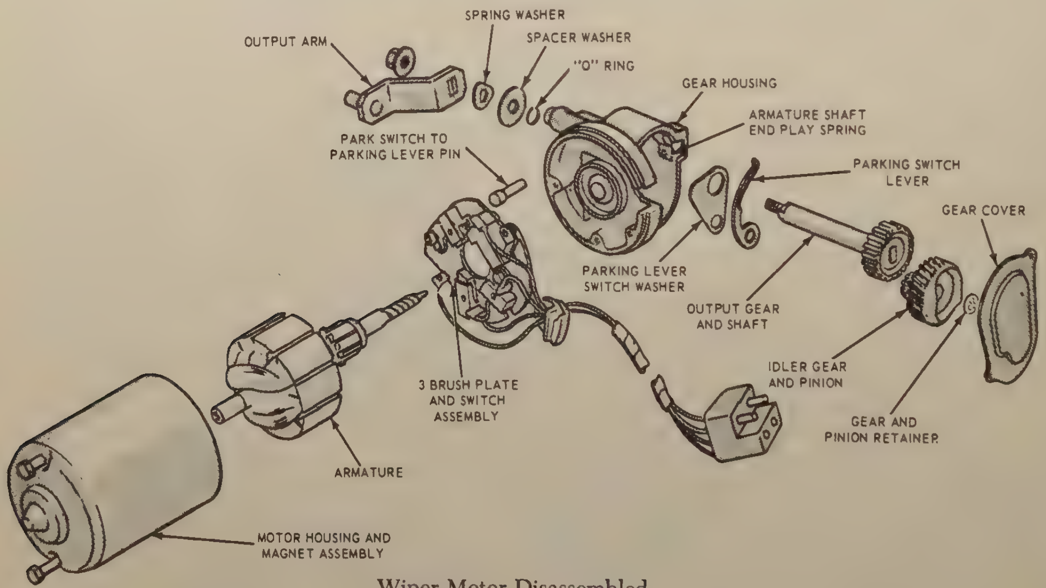
1. Disconnect the battery negative cable.
2. Remove radio rear support nut and lockwasher.
3. Remove the four radio-to-instrument panel retaining screws.
4. Pull the radio from the instrument panel and disconnect the antenna, speaker, and power leads.
5. Remove the radio.
6. Remove the knob and disc assemblies from the radio shafts.
7. Remove the two bezel retaining nuts and remove the bezel.
8. To install the radio, position the bezel on the radio and install the two bezel retaining nuts.
9. Install the disc and knob assemblies on the radio shafts.
10. Connect the antenna, speaker, and power connectors.
11. Position the radio so that the rear support mounting bolt enters the hole in the rear support mounting bracket.
12. Install the four radio-to-instrument panel retaining screws.
13. Install the radio rear support nut and lockwasher.
14. Place the speaker and the power wire harnesses in the clip on the bezel.
15. Connect the battery and check the operation of the radio.
16. Adjust the selector buttons for desired stations.



Radio Installation—1970–73


CLIP
LINKAGE ARM
PIN
LOCKING FLANGE
STEP 1 - INSTALL CLIP
STEP 2 - PUSH FORWARD
STEP 3 - LOCKED POSITION

Installation of Wiper Arm Connecting Clips


SPRING WASHER
OUTPUT ARM
SPACER WASHER
"O" RING
GEAR HOUSING
ARMATURE SHAFT END PLAY SPRING
PARK SWITCH TO PARKING LEVER PIN
PARKING SWITCH LEVER
GEAR COVER
PARKING LEVER SWITCH WASHER
OUTPUT GEAR AND SHAFT
IDLER GEAR AND PINION
3 BRUSH PLATE AND SWITCH ASSEMBLY
GEAR AND PINION RETAINER
ARMATURE
MOTOR HOUSING AND MAGNET ASSEMBLY

Wiper Motor Disassembled

Windshield Wipers

MOTOR

Removal and Installation

1. Remove the instrument cluster.
2. If air conditioned, remove the center connector and duct assembly. Remove the mounting bracket screw behind the center duct, disconnect the assembly from the plenum chamber and left duct, and pull the center connector and duct assembly out through the cluster opening.
3. Working through the cluster opening, disconnect the two pivot shaft links from the motor drive arm by removing the connecting clip.
4. Disconnect the wiring plug at the mo-

tor, remove the three retaining bolts, and remove the motor through the cluster opening.

5. To install the motor, bolt the motor to the mounting plate with the three retaining bolts.

6. Connect the right pivot shaft link to the motor and then connect the left pivot shaft link. Lock the clip as shown in the illustration.

7. On air conditioned vehicles, insert the end of the center connector and duct assembly near the mounting bracket into the left duct and the opposite end into the plenum chamber.

8. Secure the assembly with the mounting bracket screw.

9. Install the instrument cluster, and check operation of the wiper motor.

PIVOT SHAFT AND LINKAGE

Removal and Installation

Left Side

1. Remove the instrument cluster.
2. Remove the wiper arm and blade assembly from the pivot shaft.
3. Working through the cluster opening, disconnect both pivot shaft links from the motor drive arm by removing the connecting clip.
4. Remove the three bolts that retain the left pivot shaft assembly to the cowl and take the left pivot shaft assembly out through the cluster opening.
5. Before installing, cement a new gasket on the pivot shaft mounting flange. Tighten the retaining bolts to 3–7 ft lbs. After installing the pivot shaft and link assembly to the cowl, connect the right pivot shaft link to the motor drive arm first, and then connect the left link. Be sure that the connecting clip is locked as shown in the illustration.

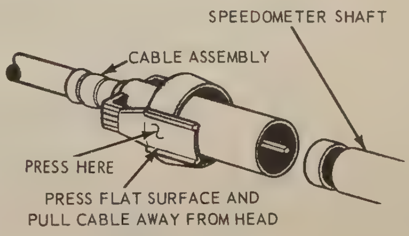
Right Side

1. Disconnect the battery negative cable.
2. Remove the wiper arm and blade assembly from the pivot shaft.
3. If the car is air conditioned, remove the right duct assembly. Unclip the duct from the right connector, slide the left end out of the plenum chamber, and lower the duct assembly out from under the instrument panel.
4. From under the instrument panel, disconnect first the left and then the right pivot shaft link from the motor drive arm by removing the remaining clip.
5. Reaching between the utility shelf (1970–73 only) and the instrument panel, remove the three bolts that retain the right pivot shaft and link assembly to the cowl. Lower the assembly out from under the instrument panel.
6. Before installing, cement a new gasket to the pivot shaft mounting flange. After installing the pivot shaft and link assembly to the cowl, be sure that the right pivot shaft link is connected to the motor drive arm before the left pivot shaft link. Be sure that the connecting clip is in the locked position as shown in the illustration.

Instrument Cluster

Removal and Installation

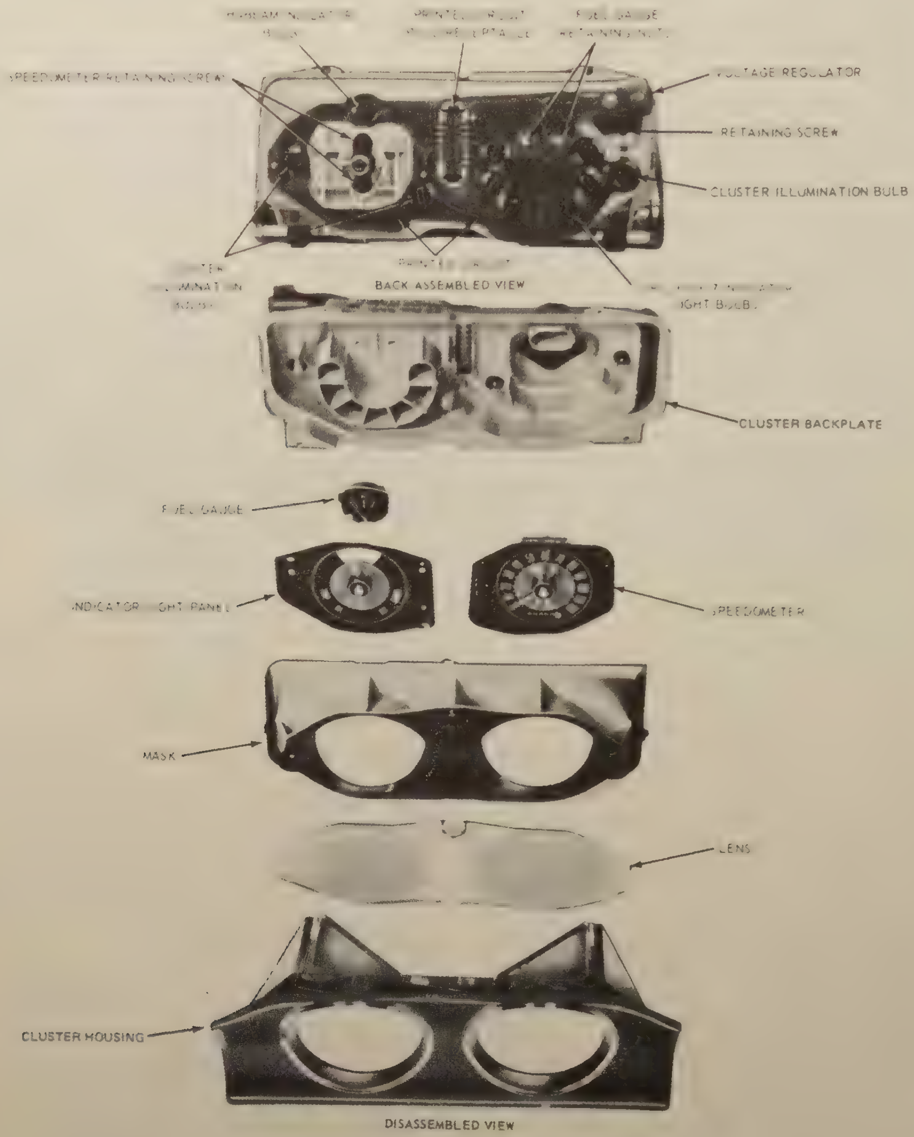
1. Disconnect the battery negative cable.
2. From under the instrument panel, disconnect the speedometer cable by pressing the flat surface of the plastic connector and pulling the cable away from the head.
3. Remove the two retaining screws at the top of the cluster and swing the cluster down from the panel.



Disconnecting Speedometer Cable

INSTRUMENT CLUSTER

Instrument Cluster Pivoted Down for Removal


HI-BEAM INDICATOR BULB
PRINTED CIRCUIT RECEPTACLE
FUEL GAUGE RETAINING NUTS
SPEEDOMETER RETAINING SCREW
VOLTAGE REGULATOR
RETAINING SCREW
CLUSTER ILLUMINATION BULB
CLUSTER ILLUMINATION BULBS
PRINTED CIRCUIT
BACK ASSEMBLED VIEW
LIGHT BULB
CLUSTER BACKPLATE
FUEL GAUGE
INDICATOR LIGHT PANEL
SPEEDOMETER
MASK
LENS
CLUSTER HOUSING
DISASSEMBLED VIEW

Instrument Cluster Disassembled

4. Disconnect the multiple connector plug from the printed circuit at the back of the cluster.

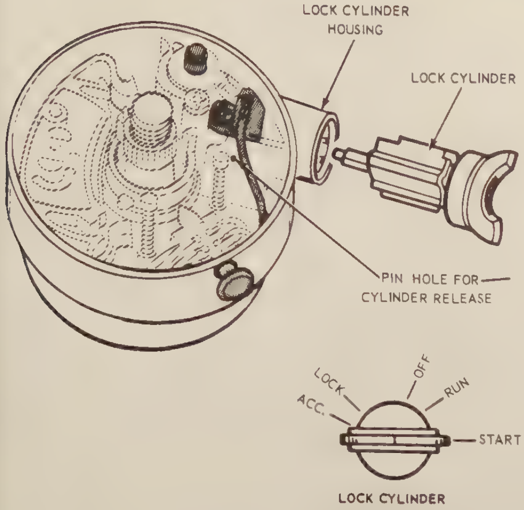
5. Remove the cluster by tilting it out at the top and disengaging the brackets on the cluster lower edge from the slots in the panel.

6. Reverse the above procedure to install.

IGNITION LOCK CYLINDER

Removal and Installation

1. Disconnect the negative battery cable.
2. On cars with a fixed steering column, remove the steering wheel trim pad and the steering wheel. Insert a stiff wire into the hole located in the lock cylinder housing.
3. Place the gearshift lever in Reverse on standard shift cars and in Park on cars with automatic transmission, and turn the ignition key to the ON or RUN position.
4. Depress wire and remove the lock cylinder and wire.
5. Insert the new cylinder into the housing and turn to the OFF position. This will lock the cylinder into position.
6. Reinstall the steering wheel and pad.
7. Connect the negative battery cable.

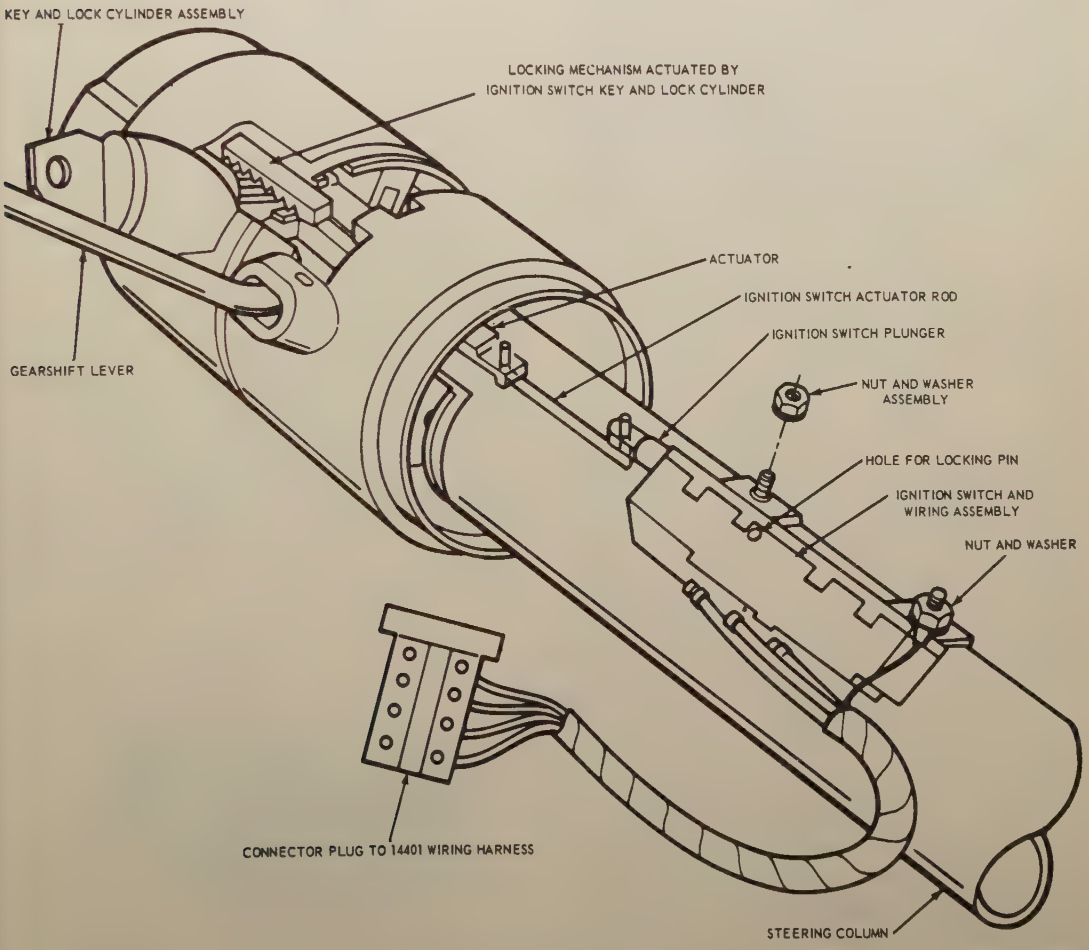

LOCK CYLINDER HOUSING
LOCK CYLINDER
PIN HOLE FOR CYLINDER RELEASE
LOCK
OFF
RUN
ACC.
START
LOCK CYLINDER OPERATING PATTERN

Ignition Lock Cylinder—1972–74 shown, 1970–71 similar

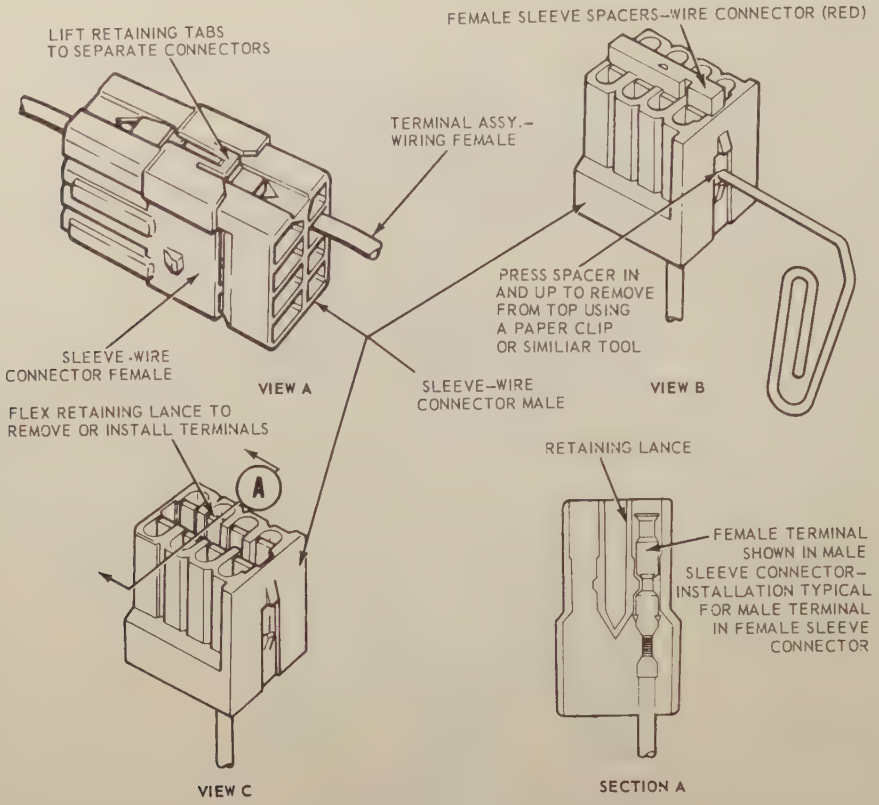
IGNITION SWITCH

Removal and Installation

1. Disconnect the negative battery cable.
2. Remove the shrouding from the steering column, and detach and lower the steering column from the brake support bracket.
3. Disconnect the switch wiring at the multiple plug.
4. Remove the two nuts that retain the switch to steering column.
5. On models with a steering column-mounted gearshift lever, disconnect the ignition switch plunger from the ignition switch actuator rod and remove the ignition switch. On models with a floor mounted gearshift lever, remove the pin that connects the switch plunger to the switch actuator and remove the switch.


KEY AND LOCK CYLINDER ASSEMBLY
LOCKING MECHANISM ACTUATED BY IGNITION SWITCH KEY AND LOCK CYLINDER
ACTUATOR
IGNITION SWITCH ACTUATOR ROD
IGNITION SWITCH PLUNGER
NUT AND WASHER ASSEMBLY
GEARSHIFT LEVER
HOLE FOR LOCKING PIN
IGNITION SWITCH AND WIRING ASSEMBLY
NUT AND WASHER
CONNECTOR PLUG TO 14401 WIRING HARNESS
STEERING COLUMN

Ignition Switch Assembly


LIFT RETAINING TABS TO SEPARATE CONNECTORS
FEMALE SLEEVE SPACERS–WIRE CONNECTOR (RED)
TERMINAL ASSY.– WIRING FEMALE
PRESS SPACER IN AND UP TO REMOVE FROM TOP USING A PAPER CLIP OR SIMILIAR TOOL
SLEEVE-WIRE CONNECTOR FEMALE
VIEW A
SLEEVE–WIRE CONNECTOR MALE
VIEW B
FLEX RETAINING LANCE TO REMOVE OR INSTALL TERMINALS
RETAINING LANCE
A
FEMALE TERMINAL SHOWN IN MALE SLEEVE CONNECTOR– INSTALLATION TYPICAL FOR MALE TERMINAL IN FEMALE SLEEVE CONNECTOR
VIEW C
SECTION A

Ignition Switch Wire Connector

6. To re-install the switch, place both locking mechanism at the top of the column and the switch itself in the lock position for correct adjustment. To hold the column in the lock position, place the automatic shift lever in PARK or the manual shift lever in Reverse, and turn to LOCK and remove the key. New switches are held in lock by plastic shipping pins. To pin existing switches, pull the switch plunger out as far as it will go and push it back in to the first detent. Insert a $\frac{3}{32}$ in. diameter wire into the locking hole in the top of the switch.

7. Connect the switch plunger to the switch actuator rod.

8. Position the switch on the column and install the attaching nuts. Do not tighten them.

9. Move the switch up and down to locate the mid-position of rod lash, and then tighten the nuts.

10. Remove the locking pin or wire.

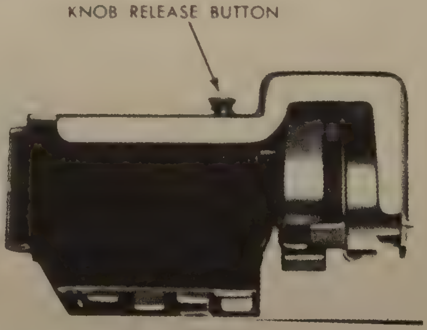
11. Attach the steering column to the brake support bracket and install the shrouding.

HEADLIGHT SWITCH

Removal and Installation

1. Disconnect the negative battery cable.

2. Remove the headlight switch control knob and shaft after depressing the release button on the rear of the switch. Some models require special procedures to gain access to the release button. They are: On Mavericks and Comets equipped with air conditioning, disconnect the left A/C duct


KNOB RELEASE BUTTON

Headlight Switch—1970–73

from the duct-to-register connector, loosen the two nuts that retain the left register to the utility shelf and remove the connector from the register.

3. After pulling the switch shaft and knob from the switch, remove the bezel nut that attaches the switch to the instrument panel.

4. Lower the switch and disconnect the lead wires from the switch.

5. Reverse the above procedure to install the new switch. When installing the new switch, insert the control knob and shaft into the switch until a distinct click is heard, signifying that the shaft is locked in place.

BACK-UP LIGHT SWITCH

Removal and Installation

NOTE: *Check the condition of the bulbs and wiring before replacing the switch.*

Column Mounted 3-Speed Manual Transmission

The switch is mounted at the lower end of the steering column inside the vehicle.

1. To remove the switch, remove the wiring retaining clip (one screw) from the brake pedal support extension.

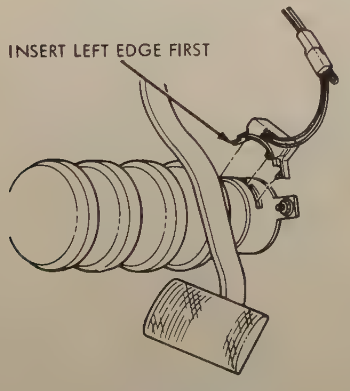
2. Disengage the switch wiring from the clip and disconnect at the plug connector.

3. Remove the switch from the steering column (two retaining screws).

4. To install the switch, route the wiring from behind the back face of the clip and around through the clip jaws.

5. Mount the clip and wiring to the brake pedal support extension.

6. Firmly apply the parking brake and depress the clutch. Have a friend observe the operation of the back-up lights when you place the gearshift in Reverse.



Back-up Light Switch—Column Mounted Shifter

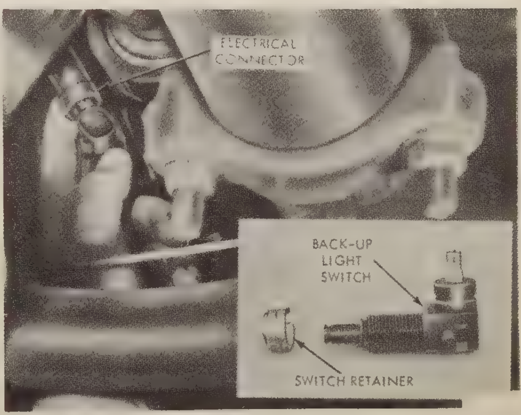
Floor Mounted 3-Speed Manual Transmission

The switch is located under the vehicle at the rear end of the transmission.

1. Place shift control lever in Neutral and raise vehicle (see Jacking Instructions in Chapter 1).

CAUTION: *Do not get under vehicle without safety stands. Allow exhaust pipes to cool before starting replacement of switch.*

2. Disconnect the electrical connector from the switch.



Back-up Light Switch—Floor Mounted Shifter

3. Pull the switch from the bracket by slightly rotating in both directions. Be sure that the switch retainer is removed from the switch.

4. Set new switch retainer in the bracket.

5. Thread the new switch through the hole in the rubber boot. Set the switch into the retainer as far as possible without forcing it.

6. Connect the electrical connector to the new switch.

7. Firmly apply the parking brake and depress the clutch. Have a friend observe the operation of the back-up lights when you place the shifter in Reverse.

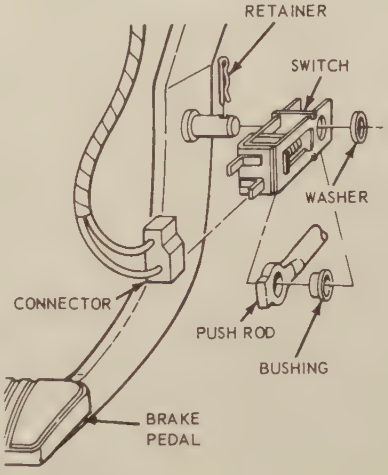
STOPLIGHT SWITCH

Removal and Installation

NOTE: *Check the condition of the bulbs before replacing the switch.*

1. Disconnect the wires at the connector as shown in the illustration.

2. Using pliers, remove the hairpin retainer.
3. Slide the stop light switch, the push rod, and the nylon washers and bushing away from the pedal to the right; remove switch in an upward direction.
4. To install the switch, position the switch, pushrod, and bushing and washers on the brake pedal pin and press the hairpin retainer into place.
5. Connect the wires at the connector.
6. Check operation of the switch.

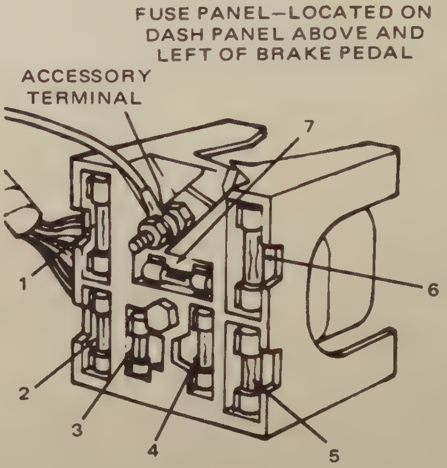

RETAINER
SWITCH
WASHER
CONNECTOR
PUSH ROD
BUSHING
BRAKE PEDAL

Stoplight Switch

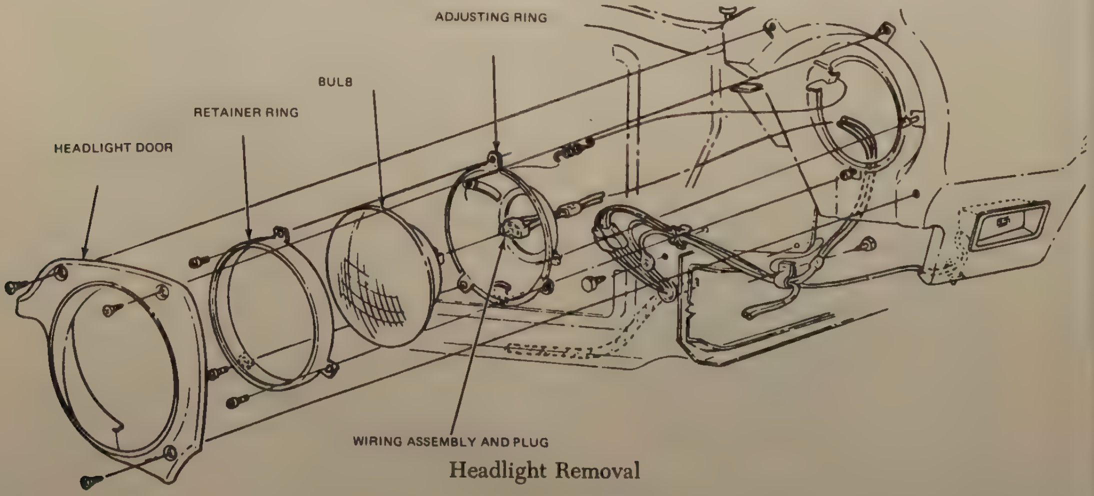
Headlights

Removal and Installation

1. Remove the 3 phillips head screws retaining the headlight door to the fender.
2. Loosen, but do not remove, the 3 screws holding the headlight retainer ring.
3. While supporting the sealed beam with one hand, rotate the retainer ring counterclockwise until the oversized holes in the ring align with the holding screws.
4. Lift the light from the housing.
5. Pull the 3-pronged electrical connector from the base of the old light and attach it to the new one.
6. Install the new light in the housing. While holding the light in position, rotate the retainer ring clockwise and then tighten the holding screws.
7. Check the operation of the headlight.
8. Align the locating tab on the bottom of the headlight door with the headlight housing. Install the 3 headlight door retaining screws.


FUSE PANEL—LOCATED ON DASH PANEL ABOVE AND LEFT OF BRAKE PEDAL
ACCESSORY TERMINAL
7
1
6
2
3
4
5

Fuse Panel Location—1970–75 models


ADJUSTING RING
BULB
RETAINER RING
HEADLIGHT DOOR
WIRING ASSEMBLY AND PLUG

Headlight Removal

Fuses and Circuit Protection—1970–75

Circuit	*Location*	*Fuse (or C.B.)*
Emergency Flasher, Cigar Lighter and Clock Feed	Fuse Box #1 terminal	AGC20/SFE20
Courtesy, Dome, Glovebox, and Luggage Compartment Lamps, and Ignition Buzzer Warning System	Fuse Box #2 terminal	SFE14
Instruments, Cluster lights, Transmission Quadrant Illum., Radio Pilot, Heater and A/C Illum., Windshield Wiper Control, Ashtray and Clock Illum.	Fuse Box #3 terminal	SFE4
Warning lights, Throttle Solenoid and/or Emission Control, and Seat Belt Warning Buzzer and Light (1972–75)	Fuse Box #4 terminal	SFE14
Heater and Defroster Feed, Air Conditioning Feed	Fuse Box #5 terminal	SFE14 (without A/C) 8AG or AGX30 (with A/C)
Back-up lights, Radio Feed, Windshield Washer, and Turn Signal Flasher (1974–75)	Fuse Box #6 terminal	AGC15/SFE15 (1970–73) SFE20 (1974–75)
Optional Equip. Accessory Feed, Rear Window Defogger, and Seat Belt Warning (1970–71)	Fuse Box #7 terminal	AGC20/SFE20
Spotlight	Inline Cartridge	SFE7.5
Headlights	Integral w/headlight switch	12-amp C.B.① 18-amp C.B.①
Horn, Stop, Side Marker, Front and Rear Parking and License Lamps	Integral w/headlight switch	15-amp C.B.
Windshield Wipers	Integral w/with wiper switch	6-amp C.B.
Charging System Load Circuit	Inline in harness	Fuse link
Electric choke (1973–75 models)	Inline in harness	Fuse link

① 12-amp C.B. with 40/50 watt headlights (before 2/1/72).
18-amp C.B. with 50/60 watt headlights (starting 2/1/72).

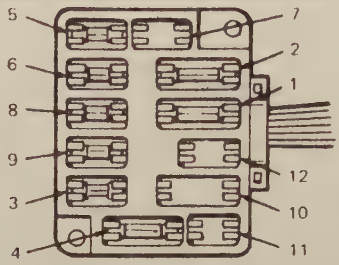
C.B.—Circuit Breaker.

Fuses and Circuit Protection—1976

Circuit Protected	*Location*	*Fuse or Circuit Breaker*
Hazard Flasher, Cigar Lighter	Fuse Box #1 terminal	15 Amp Fuse
Dome Lamp, Key Buzzer, Luggage and Glove Compartment Lamp	Fuse Box #2 terminal	15 Amp Fuse
Instrument Panel Lamps including Radio Dial, Heater, Air Conditioner	Fuse Box #3 terminal	4 Amp Fuse
Warning Lamps, Throttle Solenoid or other Emission Control Equipment	Fuse Box #4 terminal	14 Amp Fuse
(With Std. Heater) Heater/Defroster Motor (With A/C) Air Conditioner Motor	Fuse Box #5 terminal	15 Amp Fuse (30 Amp)
Back-up Lights & Turn Signals	Fuse Box #6 terminal	15 Amp Fuse
Blank	Fuse Box #7 terminal	
Radio	Fuse Box #8 terminal	7.5 Amp Fuse
Windshield Washer Motor and Accy.	Fuse Box #9 terminal	15 Amp Fuse

Fuses and Circuit Protection—1976 (cont.)

Circuit Protected	*Location*	*Fuse or Circuit Breaker*
Blank	Fuse Box #10–12 terminals	
Headlights	Part of Headlight Switch	18 Amp Circuit Breaker
Horn, Stoplights, Side Markers, Parking Lamps, License Plate Lamp		15 Amp Circuit Breaker
Windshield Wiper Motor	Part of Windshield Wiper Switch	16 Amp Circuit Breaker



Fuse Box Layout—1976 Models

Bulb Specifications

Description	*Candle-Power or Wattage*	*'70*	*'71*	*'72*	*'73*	*'74*	*'75*	*'76*
Headlights	40–50W	6012	6012	6012①	—	—	—	—
Headlights	50–60W	—	—	—	6014	6014	6014	6014
Front Park/Turn Signal	3–32C	1157A	1157	1157	1157	1157	1157NA	1157
Rear Tail/Stop/Turn	3–32C	1157	1157	1157	1157	1157	1157	1157
Back-up Lamp—Maverick	32C	1157	1157	1157	1076	1076	1156	1156
Back-up Lamp—Comet	32C	—	1076	1076	1076	1076	1156	1156
License Plate Lamp	4C	97	97	97	97	97	1178	1178
Dome Lamp	12C	105	105	561	561	561	561	561
Front and Rear Side Markers	1C	161	161	161	161②	161	161	161
Hi-Beam Indicator	2C	194	194	194	194	194	194	194
Turn Signal Indicators	2C	194	194	194	194	194	194	194
Warning Lights (Oil, Alt., Temp., Brakes, Fasten Belts)	2C	194	194	194	194	194	194	194
Instrument Illumination	2C	194	194	194	194	194	194	194
Heater Control Illumination	2C	1895	1895	—	—	—	—	—
A/C Control Illumination	2C	1895	1895	—	—	—	—	—
Heater/A/C Control Illumination	.7C	—	—	1445	1445	1445	1445	1445
Ash Tray Light	.7C	1445	1445	1445	1445	1445	1445	1445
Headlamp and Wiper Control Illumination	3C	—	—	—	1816	168	168	168
Spotlight—4.4 in. dia.	30W	4405	4405	4405	4405	4405		
Auto. Trans. Quadrant	.7C	1445	1445	1445	1445	1445	1445	1445
Luggage Compartment Light	6C	631	631	631	631	631	1178	89
Radio Pilot Light	2C	1893	1893	1893	1893	1893	1893	1893
AM/FM Stereo Indicator	2C	—	—	—	—	1892	1892	1892
Engine Compartment Light	6C	—	—	631	631	631	1178	89
Clock Light (console)	2C	—	1895	1895	1816	1816	—	—
Tachometer Light (Round)	2C	1895	1895	1895	—	—	—	—
Tachometer Light (Hood Mounted)	2C	57	—	—	—	—	—	—
Map Light	6C	—	—	—	—	105	105	105
Glovebox Light	3C	—	—	—	1816	1816	1816	1816
Instrument Panel Courtesy	6C	—	—	—	—	631	1178	89

① On vehicles built after 2/1/73, bulb number 6014 is used.
② Front side marker on 1973 Comet is #194 bulb.

6 · Clutch and Transmission

Manual Transmission

The manual transmission installed in Mavericks and Comets is a Ford design, top cover 3-speed. All forward gears are fully synchronized, helical cut and in constant mesh. A column mounted shifter is standard on all models and floor mounted shifter is optional on 1971–76 models.

The clutch is of conventional design, incorporating a single dry disc, steel spring actuated pressure plate, and release (throw-out) bearing. A 9 in. diameter disc is used on all 170 and 200 six-cylinder engines, as well as all 1970–72 250 six-cylinder engines. A 10 in. diameter disc is used on all 302 V8 engines and on 1973–76 250 six-cylinder engines.

Removal and Installation

Removal of the 3-speed manual transmission is as follows: With the car raised on a lift, mark the driveshaft so that it can be replaced in its original position relative to the components to which it is connected. Disconnect the drive shaft from the U-joint flange at the rear and slide the front of the driveshaft from the transmission extension housing and off the output shaft. Install a sealing tool into the extension housing to prevent lubricant from leaking from the transmission. Remove the capscrew and lockwasher securing the speedometer retainer to the extension housing and withdraw the cable from the housing. Disconnect the transmission controlled spark cable, if so equipped. Remove the shift rods from the shift levers at the transmission. Raise the rear of the engine enough to remove the weight from the crossmember. With the transmission supported by a transmission jack, remove the transmission from the flywheel housing. Push the transmission and jack to the rear until the input shaft clears the flywheel housing. The transmission may now be removed from the jack and mounted in a suitable fixture.

NOTE: *Do not depress the clutch pedal while the transmission is removed from the car.*

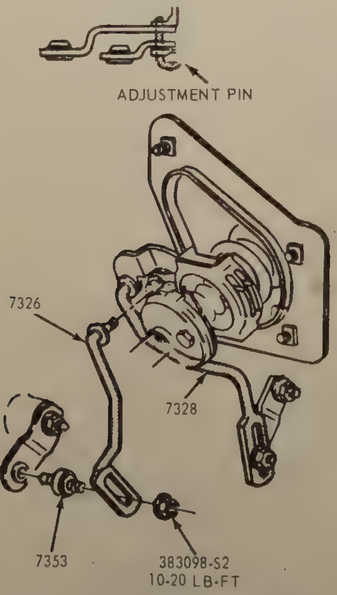
Having ensured that the machined surfaces of the transmission case and flywheel housing are clean and smooth, install the transmission as follows: Install a guide pin into each lower mounting bolt hole. Start the input shaft through the release bearing and line up the splines on the input shaft with those in the clutch disc. Move the transmission forward on the guide pins until the input shaft pilot enters the bearing or bushing on the crankshaft. Should the transmission front bearing retainer bind up on the clutch release bearing hub, work the release bearing lever back and forth until the hub slides freely onto the transmission front bearing retainer. Install the two transmission-to-flywheel housing upper mounting bolts and lockwashers. Remove the two guide pins and install the two lower bolts and lockwashers. Torque the mounting bolts to 37–42 ft lbs.

With the rear of the engine raised high enough to provide clearance, install the crossmember assembly to the frame side supports. Install the gearshift rods to the shift levers at the transmission. Install the speedometer cable and driven gear to the extension housing. Connect the transmission controlled spark cable, if so equipped. Remove the sealing tool from the extension housing and, noting the position marks made prior to removal, slide the driveshaft front universal joint yoke onto the output shaft and into the extension housing. Connect the rear universal joint to the axle pinion flange and tighten the nuts to 10-15 ft lbs. Fill the transmission with specified lubricant to the proper level and adjust the clutch pedal free-play and the shift linkage if necessary.

Linkage Adjustment

COLUMN MOUNTED SHIFTER

With the gearshift in the Neutral position, loosen the two gearshift rod adjustment nuts and check to ensure that the shift levers on the transmission are in the Neutral position. As shown in the accompanying illustration, insert a 3/16 in. diameter alignment tool through the First and Reverse gearshift lever, the Second and Third gearshift lever, and through both holes in the lower casting.



Shift Linkage Adjustment—Column Mounted Shifter

NOTE: *A suitable alignment tool can be fashioned from a 3/16 in. drill bit which is bent into an L-shape and which has perpendicular lengths of 1 in. and 2 in. from the elbow. The short end of the tool is inserted into the alignment holes.*

With the alignment tool in place, tighten the two gearshift rod adjustment nuts, then remove the tool. With the engine running, operate the shift lever to ensure that it moves freely to each position.

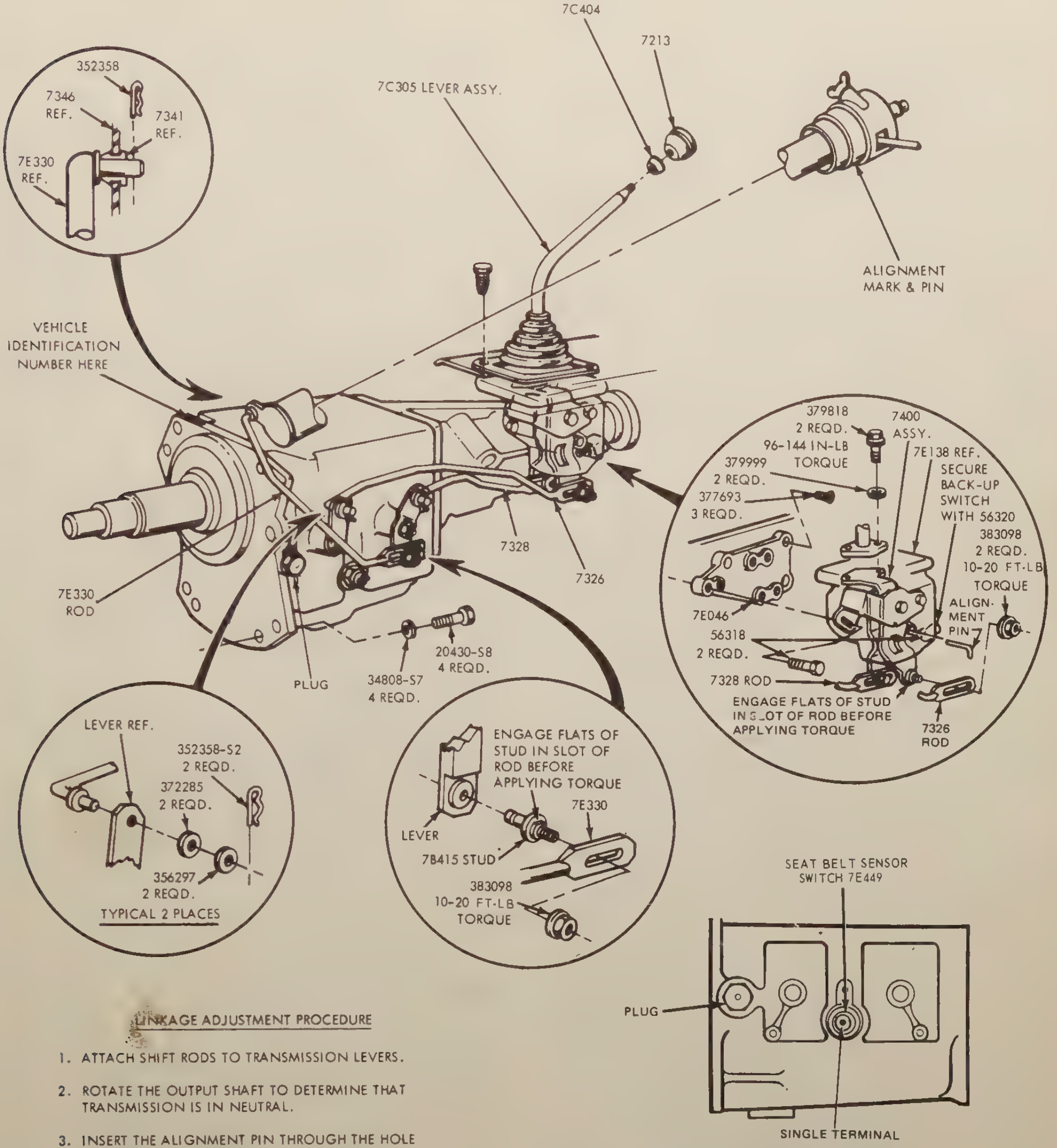
FLOOR MOUNTED SHIFTER

1. Loosen the two shift linkage adjustment nuts, making sure that the shift rods remain in the transmission shift levers.
2. Rotate the output shaft to determine that the transmission is in Neutral.
3. Insert a 1/4 in. alignment pin through the hole in the boot and into the shift control assembly alignment hole.
4. Attach the slotted ends of the shift rods over the flats of the studs on the shift control assembly. Install and tighten the two shift linkage adjusting locknuts to 10–20 in. lbs.
5. Remove the alignment pin and check the gear lever for smooth crossover.
6. Perform a lockrod adjustment.

TRANSMISSION LOCKROD ADJUSTMENT

1970 and later models with floor or console mounted shifters and manual transmissions incorporate a transmission lockrod which prevents the shifter from being moved from the Reverse position when the ignition lock is in the OFF position. The lockrod connects the shift tube in the steering column to the transmission Reverse lever. The lockrod cannot be properly adjusted until the manual linkage adjustment is correct.

1. With the transmission selector lever in the Neutral position, loosen the lockrod adjustment nut on the transmission Reverse lever.
2. Insert a .180 in. diameter rod (No. 15 drill bit) in the gauge pin hole located at the 6 o'clock position on the steering col-


7C404
7213
352358
7346 REF.
7341 REF.
7E330 REF.
7C305 LEVER ASSY.
ALIGNMENT MARK & PIN
VEHICLE IDENTIFICATION NUMBER HERE
379818 2 REQD.
96-144 IN-LB TORQUE
7400 ASSY.
7E138 REF.
379999 2 REQD.
SECURE BACK-UP SWITCH WITH 56320
377693 3 REQD.
383098 2 REQD. 10-20 FT-LB TORQUE
ALIGN-MENT PIN
7E046
56318 2 REQD.
7328 ROD
ENGAGE FLATS OF STUD IN SLOT OF ROD BEFORE APPLYING TORQUE
7326 ROD
7328
7326
7E330 ROD
20430-S8 4 REQD.
34808-S7 4 REQD.
PLUG
LEVER REF.
352358-S2 2 REQD.
372285 2 REQD.
356297 2 REQD.
TYPICAL 2 PLACES
ENGAGE FLATS OF STUD IN SLOT OF ROD BEFORE APPLYING TORQUE
7E330
LEVER
7B415 STUD
383098 10-20 FT-LB TORQUE
SEAT BELT SENSOR SWITCH 7E449
PLUG
SINGLE TERMINAL

LINKAGE ADJUSTMENT PROCEDURE

1. ATTACH SHIFT RODS TO TRANSMISSION LEVERS.
2. ROTATE THE OUTPUT SHAFT TO DETERMINE THAT TRANSMISSION IS IN NEUTRAL.
3. INSERT THE ALIGNMENT PIN THROUGH THE HOLE IN THE BOOT AND INTO THE SHIFT CONTROL ASSY. ALIGNMENT HOLE.
4. ATTACH THE SLOTTED END OF THE SHIFT RODS OVER THE FLATS OF THE STUDS ON THE SHIFT CONTROL ASSY. INSTALL LOCK NUTS TO 10-20 IN-LB TORQUE.
5. REMOVE THE ALIGNMENT PIN.

LOCK ROD ADJUSTMENT PROCEDURE

AFTER LINKAGE ADJUSTMENT, POSITION THE HAND SHIFT LEVER IN NEUTRAL. INSTALL COLUMN ALIGNMENT PIN. COLUMN CASTING MUST NOT ROTATE WITH THE PIN INSERTED. TIGHTEN ADJUSTMENT NUT TO SPECIFIED TORQUE AND REMOVE ALIGNMENT PIN.

Shift Linkage Adjustment—Floor Mounted Shifter

umn socket casting, directly below the ignition lock.

3. Manipulate the pin until the casting will not move with the pin inserted.

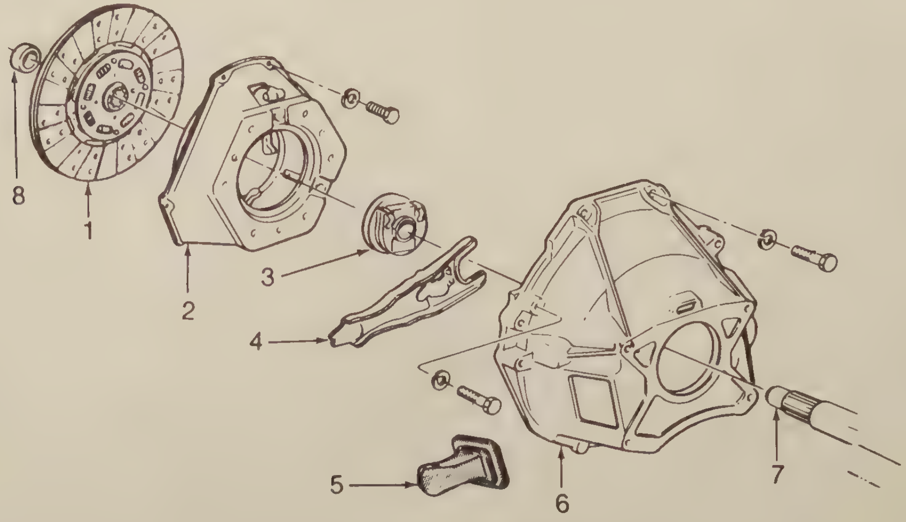
4. Torque the lockrod adjustment rod to 10–20 in. lbs.

5. Remove the pin and check the linkage operation.

Clutch

Removal and Installation

With the car raised on a lift, disconnect the driveshaft at its rear flange. Slide the



Clutch Components and Related Parts

1. Clutch disc
2. Clutch pressure plate
3. Throw-out bearing
4. Release fork
5. Release fork boot
6. Flywheel housing
7. Transmission input shaft
8. Pilot bearing

driveshaft from the transmission output shaft. Plug the opening in the extension housing. Disconnect the speedometer cable from the extension housing and the transmission controlled spark cable, if so equipped. Disconnect the gearshift rods from the transmission. Withdraw the bolts securing the transmission to the flywheel housing and move the transmission to the rear until the input shaft is clear of the flywheel, then remove it from the car. Disconnect and remove the retaining spring from the clutch release lever. Remove the starter motor cable and remove the starter motor from the flywheel housing. Remove the bolts securing the engine rear plate to the front lower part of the flywheel housing. Remove the bolts attaching the housing to the cylinder block, then move the housing back just enough to clear the pressure plate and move it to the right to free the pivot from the clutch equalizer bar. Be careful that the linkage and assist spring are not disturbed. Gradually and evenly loosen the six pressure plate cover bolts to release the spring tension and avoid distortion of the cover.

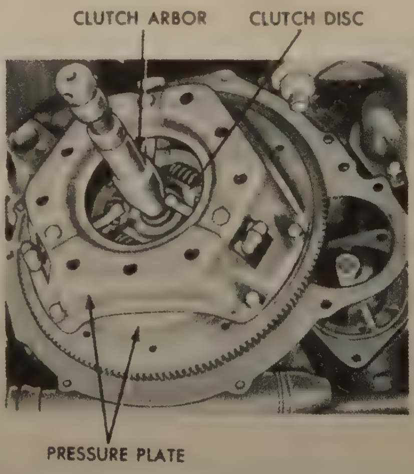
NOTE: *If the same pressure plate and cover are to be reinstalled, the cover and flywheel should be marked so that the pressure plate can be installed in its original position.*

Remove the bolts, pressure plate and clutch disc from the flywheel.

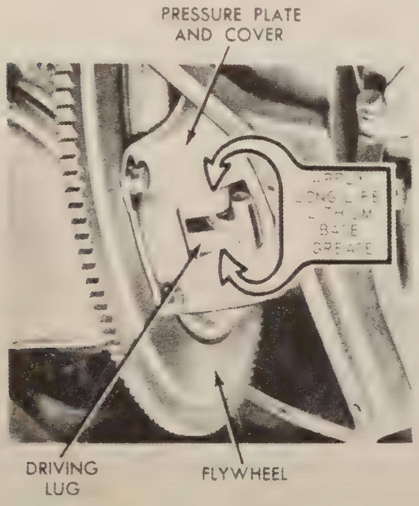
Install the clutch release lever, if it was removed, and position the clutch disc and pressure plate assembly on the flywheel. Partially install the cover attaching bolts in order to hold the components in place, but do not tighten the bolts yet.

NOTE: *When handling the clutch components, especially the clutch disc face, avoid allowing grease or dirt to contact the parts.*

Use an old transmission input shaft or a clutch aligning tool (see accompanying il-



Installing Clutch Disc using Alignment Tool lustration) to line up the clutch disc, and alternately tighten the bolts gradually until they are all tight. Before removing the input shaft or aligning tool, tighten the cover bolts to a torque of 12-20 ft lbs. A light film of grease should be applied to the outside diameter of the transmission front bearing retainer and also to both sides of the release lever fork where the fork contacts the release bearing bore spring clips. Use a light film of grease on the release bearing surface where contact is made with the pressure plate release fingers and fill the grease groove of the release bearing hub with grease. Lithium-base grease is specified for all clutch lurbication applications. All excess grease should be cleaned from the inside bore of the bearing hub, as excess grease could find its way to the clutch disc and cause slippage.



Pressure Plate Lubrication Points

Place the release bearing and the hub on the release lever. Examine the flywheel housing and cylinder block mounting surfaces for cleanliness and position the felt washer on the pivot in the flywheel housing. Being careful not to disturb the clutch linkage, slip the pivot into the clutch equalizer shaft and position the flywheel housing on the dowels in the cylinder block. Install the attaching bolts and alternately tighten to 23–33 ft lbs on 1970–72 six-cylinder models; 40–50 ft lbs on 1971–72 V8 models; and 38–55 ft lbs on all 1973–76 models. Install the starter motor and replace the cable. Having ensured that the joining surfaces of the transmission and flywheel housing are clean and smooth, insert two guide pins in the flywheel housing lower mounting bolt holes. Push the transmission forward on the guide pins until it is tight against the flywheel housing. Install the two upper mounting bolts, remove the guide pins from the lower mounting holes and install the lower bolts. The bolts should be tightened to 37–42 ft lbs.

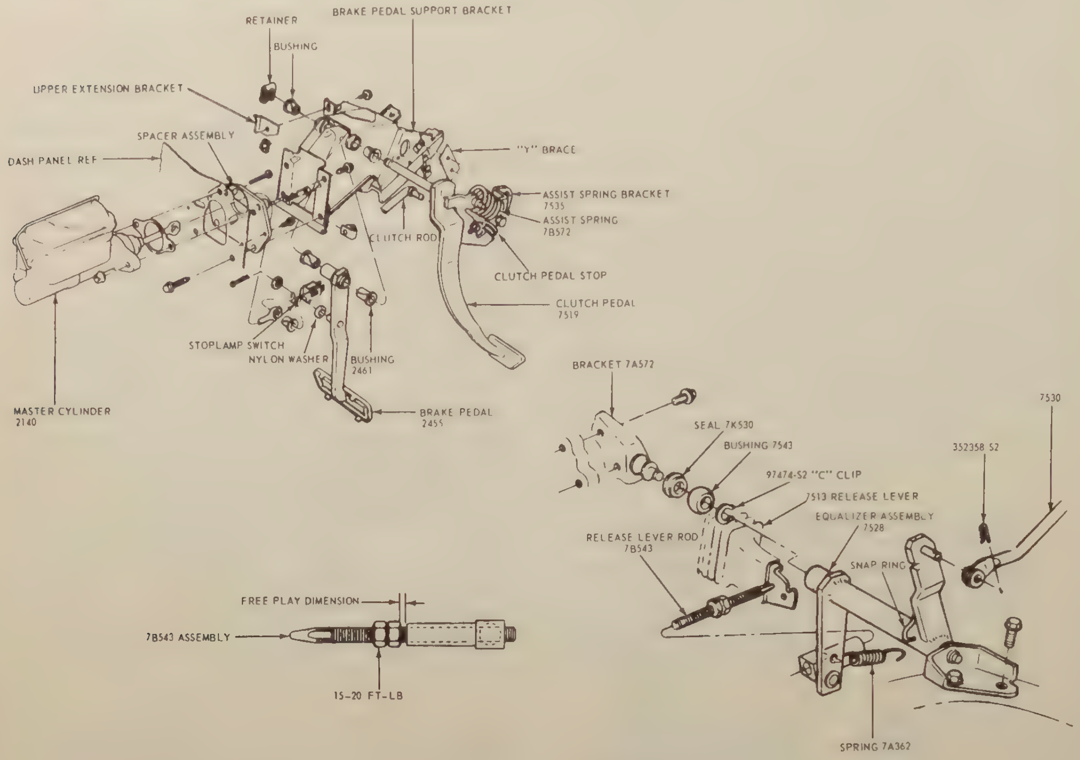
With the rear of the engine raised, install the crossmember and attaching bolts, then lower the engine. Install and tighten the extension housing-to-engine rear support bolts. Remove the jack from the transmission and connect the cable for the parking brake. Connect the gearshift rods to the transmission and adjust the shift linkage if necessary. Connect the release lever retaining spring. Remove the sealing tool from the transmission output shaft and install the driveshaft. Check the free-play of the clutch pedal as outlined in the following section.

Free-Play Adjustment

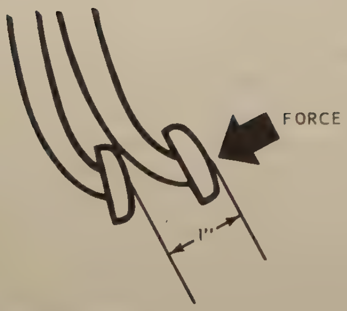
CAUTION: *If the clutch cannot be adjusted without raising the car, install jack stands beneath the lower control arms to keep the car from falling.*

Whenever new clutch parts are installed, or when the clutch does not disengage as it should, the free-play of the clutch pedal should be adjusted.

With the clutch return spring disconnected from the release lever, loosen the locknut and adjusting nut on the release lever rod and move the release lever to the rear until the release bearing just contacts the clutch pressure plate release fingers. Adjust the length of the rod until the rod seats in the pocket of the release lever. With a .136 in. feeler gauge inserted between the adjusting nut and swivel sleeve, tighten the adjusting nut against the gauge. Tighten the locknut against the adjusting nut, being careful not to move the adjusting nut. The locknut should be tightened to a torque of 15–20 ft lbs. Remove the feeler gauge and install the clutch return spring. Check the free travel at the clutch pedal—this should be 1.0 in. Readjust the free-play if necessary. Free-play is increased by moving the adjusting nut away from the swivel sleeve, and decreased by moving the adjusting nut toward the sleeve. As a final check, measure the free-play at


RETAINER
BRAKE PEDAL SUPPORT BRACKET
BUSHING
UPPER EXTENSION BRACKET
SPACER ASSEMBLY
DASH PANEL REF
"Y" BRACE
ASSIST SPRING BRACKET 7535
ASSIST SPRING 7B572
CLUTCH ROD
CLUTCH PEDAL STOP
CLUTCH PEDAL 7519
STOPLAMP SWITCH
NYLON WASHER
BUSHING 2461
BRACKET 7A572
MASTER CYLINDER 2140
BRAKE PEDAL 2455
7530
SEAL 7K530
BUSHING 7543
352358 S2
97474-S2 "C" CLIP
7513 RELEASE LEVER
EQUALIZER ASSEMBLY 7528
RELEASE LEVER ROD 7B543
SNAP RING
FREE PLAY DIMENSION
7B543 ASSEMBLY
15–20 FT–LB
SPRING 7A362

Clutch Pedal and Linkage Disassembled



Clutch Pedal Free-Play

the pedal with the transmission in Neutral and the engine running at about 3,000 rpm. The pedal free-play at this speed should be at least ½ in. If it is less than ½ in., the free-play will have to be readjusted. If the clutch has too little free-play, the clutch may be held in the partially disengaged position, leading to premature failure of the clutch and bearing.

Automatic Transmisson

Two types of automatic transmissions have been used in Mavericks and Comets. A fully automatic C4 transmission is used in all 1970–76 applications. A semi-automatic C4S transmission was offered on the 1970 Maverick only and was dropped in 1971.

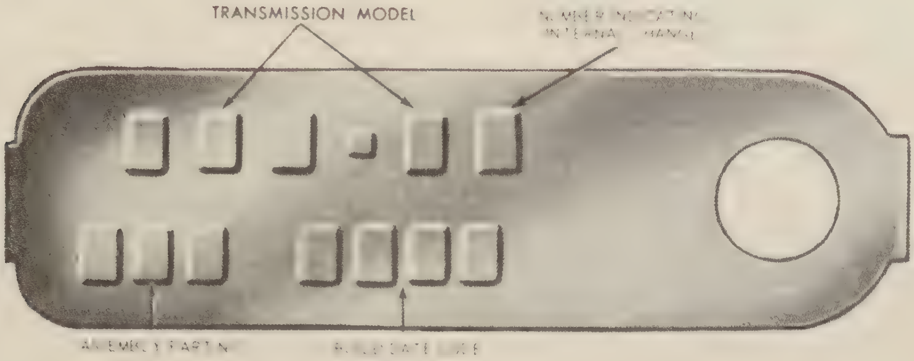
The C4 automatic transmission is a 3-speed unit capable of providing automatic upshifts and downshifts through the 3 forward gear ratios, and also capable of providing manual selection of First and Second gears.

The C4S semi-automatic transmission is a manually operated power shift transmission which does not require a clutch pedal. The C4S is similar to the C4 fully automatic transmission except for changes in the control valve body and that the vacuum diaphragm, throttle rod, governor and the inner and outer downshift lever assemblies have been eliminated.

Both transmissions consist essentially of a torque converter, planetary gear train, two multiple disc clutches, a one-way clutch and a hydraulic control system.

The only adjustments on the transmissions are the intermediate and low-reverse bands.

An identification tag is located under the lower front intermediate servo cover bolt.



Transmission Identification Tag

The tag shows the model prefix and suffix, assembly part numbers, and the built-date code.

Pan Removal and Fluid Draining

Normal maintenance and lubrication requirements do not include periodic changes of transmission fluid. A change is required only when it is necessary to replace the transmission fluid. At this time the converter, oil cooler core, and cooler lines should be thoroughly flushed out to remove any dirt or deposits that might clog these units later.

When filling a completely dry (no fluid) transmission and converter, install five quarts of transmission fluid and then start the engine. Shift the selector lever through all positions briefly and set at Park position. Check the fluid level and add enough fluid to raise the level to between the marks on the dipstick. Do not overfill the transmission.

The procedure for a partial drain and refill of the transmission fluid is as follows:

1. Raise the car on a hoist or jack stands.
2. Place a drain pan under the transmission pan.

NOTE: *On PEA and PEF models (see identification tag), the fluid is drained by disconnecting the filler tube from the transmission fluid pan.*

3. Loosen the pan attaching bolts to allow the fluid to drain.
4. When the fluid has stopped draining to level of the pan flange, remove the pan bolts starting at the rear and along both sides of the pan, allowing the pan to drop and drain gradually.
5. When all the transmission fluid has drained, remove the pan and the fluid filter and clean them.
6. After completing the transmission repairs of adjustments, install the fluid filter screen, a new pan gasket, and the pan on the transmission. Tighten the pan attaching bolts to 12–16 ft lbs.

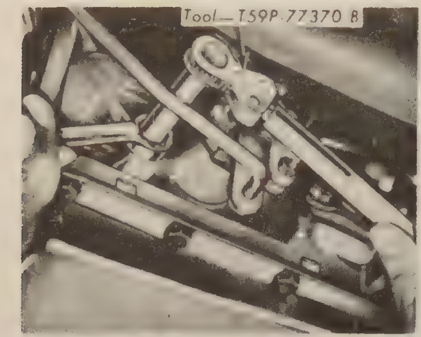
NOTE: *Be sure to use Type "F" transmission fluid. The use of any other type of fluid such as Type "A" suffix "A," or DEXRON will materially affect the service life of the transmission.*

7. Install three quarts of transmission fluid through the filler tube. If the filler tube was removed to drain the transmission, install the filler tube using a new O-ring.
8. Start and run the engine for a few minutes at low idle speed and then at the fast idle speed (about 1200 rpm) until the normal operating temperature is reached. Do not race the engine.
9. Move the selector lever through all positions and place it at the Park position. Check the fluid level, and add fluid until the level is between the "add" and "full" marks on the dipstick. Do not overfill the transmission.

Band Adjustment

Intermediate Band

1. Clean all the dirt from the band adjusting screw area. Remove and discard the locknut.
2. Install a new locknut on the adjusting screw. With the tool shown in the illustration, tighten the adjusting screw until the tool handle clicks. The tool is a pre-set torque wrench which clicks and breaks



Adjusting Intermediate Band

when the torque on the adjusting screw reaches 10 ft lbs.

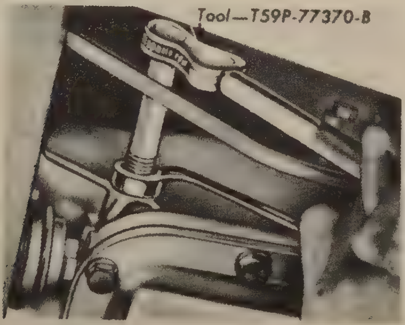
3. *Back off the adjusting screw exactly 1¾ turns.*

4. Hold the adjusting screw from turning and torque the locknut to 35–45 ft lbs.

Low-Reverse Band

1. Clean all dirt from around the band adjusting screw, and remove and discard the locknut.

2. Install a new locknut on the adjusting screw. Using the tool shown in the illustration, tighten the adjusting screw until the wrench clicks and breaks at 10 ft lbs torque.



Adjusting Low-Reverse Band

3. Back off the adjusting screw *exactly 3 full turns.*

4. Hold the adjusting screw steady and tighten the locknut to 35–45 ft lbs.

Automatic Shift Linkage Adjustment

Column Shift

1. Place the selector lever in the D (Drive) position against the D stop. On 1970 Mavericks with the C4S semi-automatic transmission, place the selector in the Hi position.

2. Loosen the shift rod adjusting nut at point A as shown in the illustration.

3. Shift the lever at the transmission into the D or Hi position, third detent from the rear on 1970–71 cars and second detent from the rear on 1972–76 cars.

4. Make sure the selector lever on the steering column has not moved from the D or Hi position, then tighten the nut at point A to 10–20 ft lbs.

5. Start the car and check the operation of the selector lever in each selector lever position.

Floor or Console Shift

1. Place the transmission selector lever in the D (Drive) position against the rearward D stop.

2. Raise the vehicle and install jack stands beneath the lower control arms. Move the lever on the transmission to the D position, third detent from the back of the transmission on 1971 models, and second detent from the rear on 1972–76 models.

3. With both the selector lever and transmission lever in the D position, torque the attaching nut to 10–20 ft lbs.

4. Start the car and check the operation of the transmission in each selector lever position.

Lock Rod Adjustment

Floor or Console Shift Only

1. Adjust the shift linkage as outlined under "Automatic Shift Linkage Adjustment".

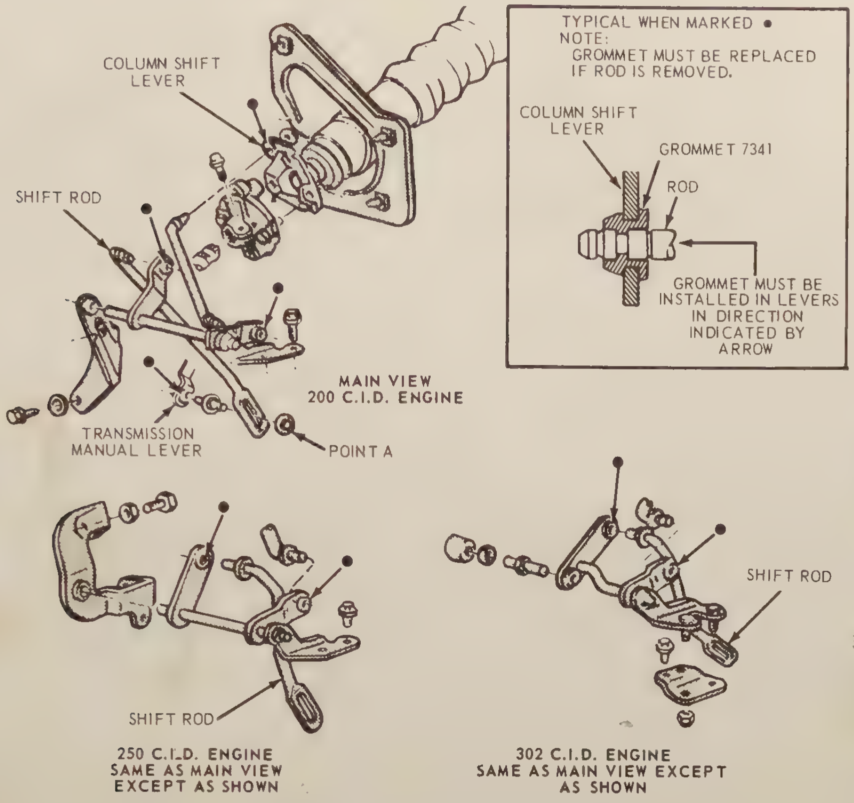
2. Raise the vehicle and install jack stands beneath the lower control arms. Loosen the lockrod retaining nut.

3. Remove the jack stands and lower the vehicle. Place the selector lever in the D position, tightly against the D stop.

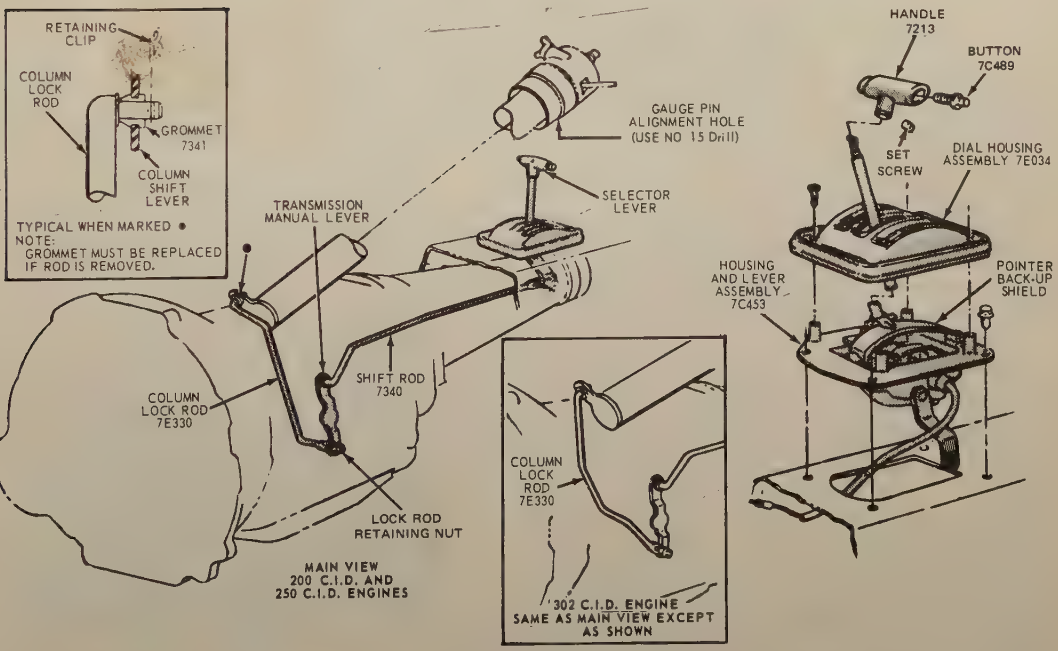
4. Align the hole in the steering column socket casting with the column alignment mark and insert a 0.180 in. diameter pin (no. 15 drill). The column casting must not rotate with the gauge pin in position.

5. Raise the vehicle and reinstall the jack stands. Torque the lockrod retaining nut to 10–20 ft lbs.

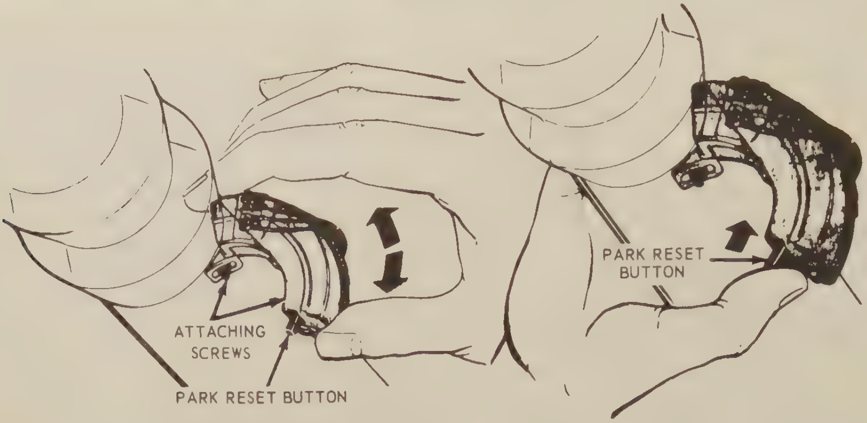
6. Remove the jack stands and lower the vehicle. Remove the gauge pin and check the linkage for proper operation.


TYPICAL WHEN MARKED ●
NOTE:
GROMMET MUST BE REPLACED IF ROD IS REMOVED.
COLUMN SHIFT LEVER
GROMMET 7341
ROD
GROMMET MUST BE INSTALLED IN LEVERS IN DIRECTION INDICATED BY ARROW
COLUMN SHIFT LEVER
SHIFT ROD
MAIN VIEW
200 C.I.D. ENGINE
TRANSMISSION MANUAL LEVER
POINT A
SHIFT ROD
SHIFT ROD
250 C.I.D. ENGINE
SAME AS MAIN VIEW
EXCEPT AS SHOWN
302 C.I.D. ENGINE
SAME AS MAIN VIEW EXCEPT
AS SHOWN

C4 Column Shift Linkage


RETAINING CLIP
COLUMN LOCK ROD
GROMMET 7341
COLUMN SHIFT LEVER
TYPICAL WHEN MARKED ●
NOTE:
GROMMET MUST BE REPLACED IF ROD IS REMOVED.
HANDLE 7213
BUTTON 7C489
GAUGE PIN ALIGNMENT HOLE (USE NO 15 Drill)
SET SCREW
DIAL HOUSING ASSEMBLY 7E034
SELECTOR LEVER
TRANSMISSION MANUAL LEVER
HOUSING AND LEVER ASSEMBLY 7C453
POINTER BACK-UP SHIELD
SHIFT ROD 7340
COLUMN LOCK ROD 7E330
LOCK ROD RETAINING NUT
MAIN VIEW
200 C.I.D. AND
250 C.I.D. ENGINES
COLUMN LOCK ROD 7E330
302 C.I.D. ENGINE
SAME AS MAIN VIEW EXCEPT
AS SHOWN

C4 Floor Shift Linkage



Adjusting Neutral Start Switch—1970 Column Shift

Neutral Start Switch Adjustment

COLUMN SHIFT

1970 Maverick Only

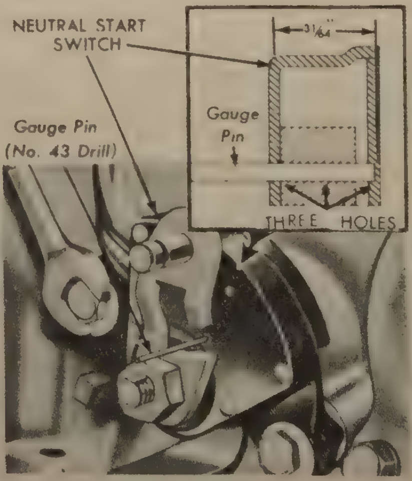
1. While holding the selector lever against the Neutral stop, attempt to start the engine. If the engine starts while holding the lever against the stop, but does not start when the lever is released, the shift linkage is in need of adjustment. If the engine does not start in either condition, the neutral start switch needs adjusting.
2. To adjust the switch in Neutral, place the selector lever against the stop of the Neutral detent position.
3. Loosen the two retaining screws locating the switch on the steering column.
4. With the selector lever held against the Neutral stop, rotate the switch until you are able to start the engine in the Neutral position. Then, tighten the switch retaining screws to a torque of 20 in. lbs.
5. With the switch properly adjusted in Neutral, place the selector lever in the "l" position and push the park reset button (see illustration) counterclockwise until it stops.
6. Place the selector lever in the Park position. Release the selector lever and attempt to start the engine. If the engine starts, fine. If not, reset the park adjustment.
7. To adjust the switch for the Park position, place the selector lever in "l" and push the park reset button (see illustration) counterclockwise until it stops.
8. Finally, check the operation of the switch in each selector lever position. The starter should engage only in the Neutral and Park positions. If any further adjustments are made, be sure to reset the park reset button as in Steps 5 and 7.

If, after performing the switch adjustments, the engine still will not start in Neutral or Park, the switch will have to be replaced.

FLOOR OR CONSOLE SHIFT

1971–76 Only

1. Adjust the shift linkage as outlined under "Automatic Shift Linkage Adjustment".
2. Loosen the two neutral start switch attaching bolts underneath the transmission selector lever on the transmission case.
3. With the lever on the transmission in Neutral, rotate the switch in insert a No. 43 gauge pin into the gauge pin holes of the switch. The gauge pin must be inserted a



Adjusting Neutral Start Switch—1971–76 Floor Shift full $^{31}/_{64}$ in. into the 3 holes of the switch.

4. Torque the two switch attaching bolts to 55–75 in. lbs. Remove the gauge pin from the switch.

5. Check the operation of the switch. The engine should start only with the selector lever in Neutral or Park.

Neutral Start Switch Removal and Installation

COLUMN MOUNTED SHIFTER TYPE

To properly remove and install the neutral start switch, use the following procedure:

1. Disconnect the neutral start switch wires at the plug connector.
2. Disconnect the vacuum hoses, if so equipped.
3. Remove the two screws securing the neutral start switch to the steering column and lift the switch from the column. Check the column to be sure that the metal switch actuator is secure to the shift tube and that it is seated as far forward against the shift tube bearing as is possible. Also check for a broken or damaged actuator. If it is broken or damaged, replace it.
4. Before installing a new switch to the column, check to see that the red neutral position gauge is inserted in the neutral pinning hole. If the pin is missing, align the two holes at the neutral pinning hole on top of the switch and install a No. 43 drill or 0.092–0.093 in. gauge pin.
5. While holding the selector lever against the stop in the Neutral detent position, place the switch on the column and install the two attaching screws. Tighten the screws to 20 in. lbs. torque.
6. Remove the gauge pin (or drill if used).
7. Connect the switch wires to the plug connector and check for a start in the Neutral position. The starter should engage with the selector lever against the Neutral stop. If not, loosen the attaching screws and move the switch just enough to engage the starter. Tighten the screws.
8. With the switch properly adjusted in Neutral, push the park reset button to the left (counterclockwise) until it stops.
9. To adjust the switch for the Park position, place the transmission selector lever in 1 and push the park reset button to the left until it stops.
10. Connect the vacuum hoses to the switch, if so equipped.
11. Check the operation of the switch in each selector lever position. The starter should engage in only the Neutral and Park detent positions.

7 · Drive Train

Driveline

The driveshaft is the means by which the power from the engine and transmission (in the front of the car) is transferred to the differential and rear axles, and finally to the rear wheels.

The driveshaft assembly incorporates two universal joints—one at each end—and a slip yoke at the front end of the assembly, which fits into the back of the transmission.

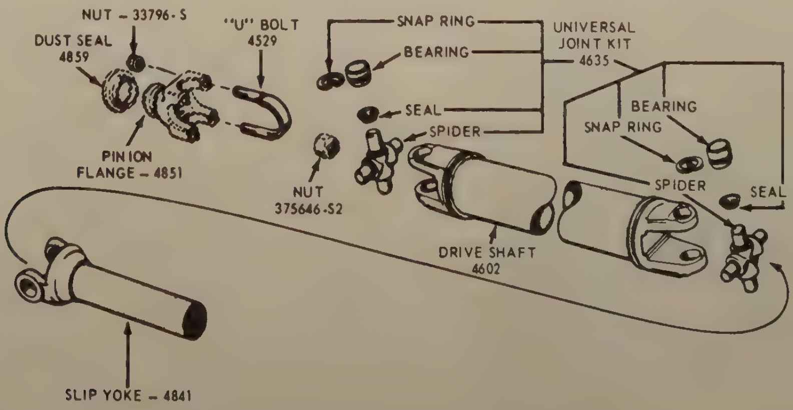
All driveshafts are balanced when installed in a car. It is therefore imperative that before applying undercoating to the chassis, the driveshaft and universal joint assembly be completely covered to prevent the accidental application of undercoating to their surfaces, and the subsequent loss of balance.

DRIVESHAFT AND U-JOINTS

Driveshaft Removal

The procedure for removing the driveshaft assembly—complete with universal joint and slip yoke—is at follows:

1. Mark the relationship of the rear driveshaft yoke and the drive pinion flange of the axle. If the original yellow alignment marks are visible, there is no need for new marks. The purpose of this marking is to facilitate installation of the assembly in its


NUT – 33796-S
DUST SEAL 4859
"U" BOLT 4529
SNAP RING
BEARING
UNIVERSAL JOINT KIT 4635
SEAL
SPIDER
BEARING
SNAP RING
PINION FLANGE – 4851
NUT 375646-S2
SPIDER
SEAL
DRIVE SHAFT 4602
SLIP YOKE – 4841

Driveshaft and Universal Joints Disassembled exact original position, thereby maintaining proper balance.

2. Remove the 4 bolts which hold the rear universal joint to the pinion flange. Wrap tape around the loose bearing caps in order to prevent them from falling off the spider.

3. Pull the driveshaft toward the rear of the vehicle until the slip yoke clears the transmission housing and the seal. Plug the hole at the rear of the transmission housing or place a container under the opening to catch any fluid which might leak.

Universal Joint Overhaul

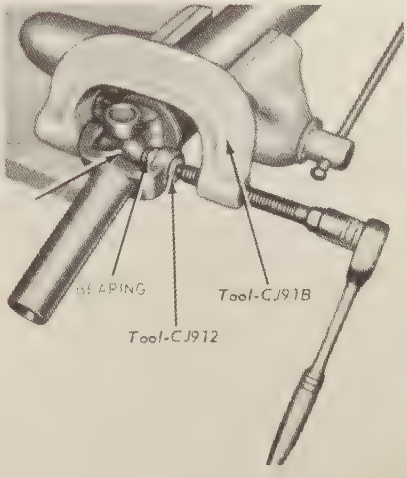
1. Position the driveshaft assembly in a sturdy vise.

2. Remove the snap-rings which retain the bearings in the slip yoke (front only) and in the driveshaft (front and rear).

3. Using a large punch or an arbor press, drive one of the bearings in toward the center of the universal joint, which will force the opposite bearing out.

4. As each bearing is pressed or punched far enough out of the universal joint assembly that it is accessible, grip it with a pair of pliers, and pull it from the driveshaft yoke. Drive or press the spider in the opposite direction in order to make the opposite bearing accessible, and pull it free with a pair of pliers. Use this procedure to remove all bearings from both universal joints.

5. After removing the bearings, lift the spider from the yoke.



Removing Universal Joint Bearing

6. Thoroughly clean all dirt and foreign matter from the yoke are on both ends of the driveshaft.

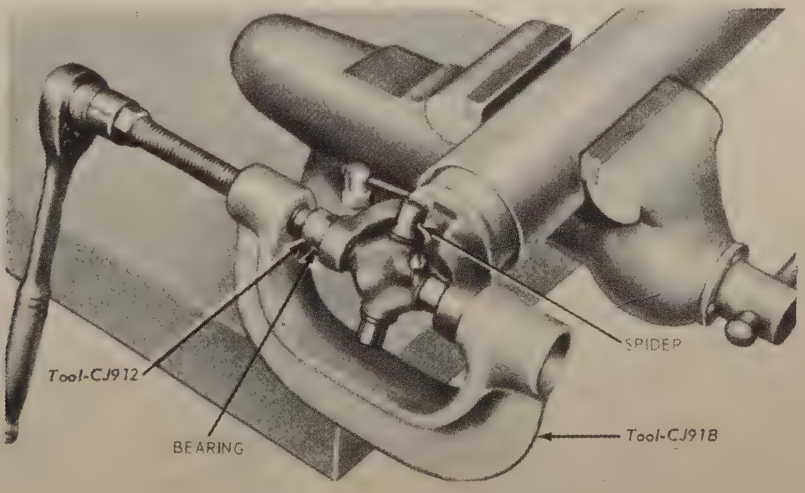
NOTE: *When installing new bearings in the yokes, it is advisable to use an arbor press. However, if this tool is not available, the bearings should be driven into position with extreme care, as a heavy jolt on the needle bearings can easily damage or misalign them, greatly shortening their life and hampering their efficiency.*

7. Start a new bearing into the yoke at the rear of the driveshaft.

8. Position a new spider in the rear yoke and press (or drive) the new bearing ¼ in. below the outer surface of the yoke.

9. With the bearing in position, install a new snap-ring.

10. Start a new bearing into the opposite side of the yoke.



Installing Universal Joint Bearing

11. Press (or drive) the bearing until the opposite bearing—which you have just installed—contacts the inner surface of the snap-ring.

12. Install a new snap-ring on the second bearing. It may be necessary to grind the surface of this second snap-ring.

13. Reposition the driveshaft in the vise, so that the front universal joint is accessible.

14. Install the new bearings, new spider, and new snap-rings in the same manner as you did for the rear universal joint.

15. Position the slip yoke on the spider. Install new bearings, nylon thrust bearings, and snap-rings.

16. Check both reassembled joints for freedom of movement. If misalignment of any part is causing a bind, a sharp rap on the side of the yoke with a brass hammer should seat the bearing needles and provide the desired freedom of movement. Care should be exercised to firmly support the shaft end during this operation, as well as to prevent blows to the bearings themselves. Under no circumstances should a driveshaft be installed in a car if there is any binding in the universal joints.

Driveshaft Installation

1. Carefully inspect the rubber seal on the output shaft and the seal in end of the transmission extension housing. Replace them if they are damaged.

2. Examine the lugs on the axle pinion flange and replace the flange if the lugs are shaved or distorted.

3. Coat the yoke spline with special-purpose lubricant. The Ford part number for this lubricant is B8A-19589-A.

4. Remove the plug from the rear of the transmission housing.

5. Insert the yoke into the transmission housing and onto the transmission output shaft. Make sure that the yoke assembly does not bottom on the output shaft with excessive force.

6. Locate the marks which you made on the rear drive shaft yoke and the pinion flange prior to removal of the driveshaft assembly. Install the driveshaft assembly with the marks properly aligned.

7. Install the U-bolts and nuts that attach the universal joint to the pinion flange. Torque the U-bolt nuts to 8–15 ft lbs.

Rear Axle Assembly

The Maverick and Comet have used two basic rear axle assemblies. They are the integral carrier type and the removable carrier type. The integral carrier type was available on 1970–71 models using the 170 or 200 six-cylinder engines. Although this type has an inspection plate which provides working access to the differential components, it is recommended that the entire axle assembly be removed from the car to perform differential work.

The removable carrier type is installed on 1970–71 models using the 250 six-cylinder or 302 V8 engines, and on all 1972 and later Mavericks and Comets. The carrier assembly may be unbolted from the axle housing to perform differential work.

Procedure for removing the axle shafts and their bearings are the same for both types. In order to remove the axles, their housings need not be removed from the car.

AXLE SHAFT

Shaft Removal and Installation and/or Bearing Replacement

NOTE: *Bearings must be pressed on and off the shaft with an arbor press. Unless you have access to one, it is inadvisable to attempt any repair work on the axle shaft and bearing assemblies.*

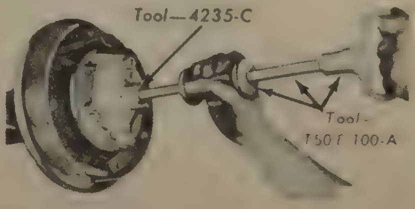
1. Remove the wheel, tire, and brake drum.

2. Remove the nuts holding the retainer plate to the backing plate. Disconnect the brake line.

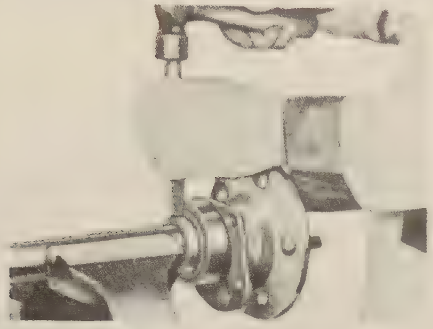
3. Remove the retainer and install nuts, finger-tight, to prevent the brake backing plate from being dislodged.

4. Pull out the axle shaft and bearing assembly, using a slide hammer.

NOTE: *If end-play is found to be exces-*



Removing Axle Shaft



Removing Rear Wheel Bearing Retainer Ring

sive, the bearing should be replaced. Shimming the bearing is not recommended as this ignores end-play of the bearing itself and could result in improper seating of the bearing.

5. Using a chisel, nick the bearing retainer in 3 or 4 places. The retainer does not have to be cut, but merely collapsed sufficiently to allow the bearing retainer to be slid from the shaft.

6. Press off the bearing and install the new one by pressing it into position.

7. Press on the new retainer.

NOTE: *Do not attempt to press the bearing and the retainer on at the same time.*

8. Assemble the shaft and bearing in the housing, being sure that the bearing is seated properly in the housing.

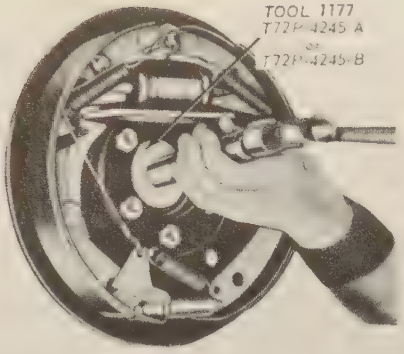
9. Install the retainer, drum, wheel, and tire. Bleed the brakes.

Axle Shaft Seal Replacement

1. Remove the axle shaft from the rear axle assembly, following the procedures previously discussed.

2. Using a two-fingered seal puller (slide hammer), remove the seal from the axle housing.

3. Thoroughly clean the recess in the rear axle housing from which the seal was removed.



Installing Rear Wheel Bearing Oil Seal

4. Position a new seal on the housing and drive it into place with a seal installation tool. If this tool is not available, a wood block may be substituted.

NOTE: *Although the right and left-hand seals are identical, there are many different types of seals which have been used on Maverick and Comet rear axle assemblies. It is advisable to have one of the old seals with you when you are purchasing new ones.*

5. When the seal is properly installed, install the axle shaft.

Procedure for Determining Rear Axle Ratio

1. Jack up the rear of the car enough to clear the rear wheels and place on jack stands.

2. Place a horizontal chalk mark on the driveshaft and a vertical chalk mark on the inside of the tire.

3. Slowly turn the driveshaft and count the revolutions it takes to turn the tire once. As an example if it takes 3½ revolutions of the driveshaft to turn the wheel once, then the axle ratio is 3½ to one or 3.50:1.

8 · Suspension and Steering

Rear Suspension

All Mavericks and Comets employ a semi-elliptic leaf spring rear suspension. The axle housing is supported by a pair of conventional, longitudinally mounted leaf springs. The housing is secured to the center of the springs by two U-bolts, retaining plates, spring pads and nuts. Each spring is suspended from the underbody side rail by a hanger at the front and a shackle at the rear. A pair of telescopic shock absorbers are mounted between the leaf spring retaining plates and brackets welded to the crossmember.

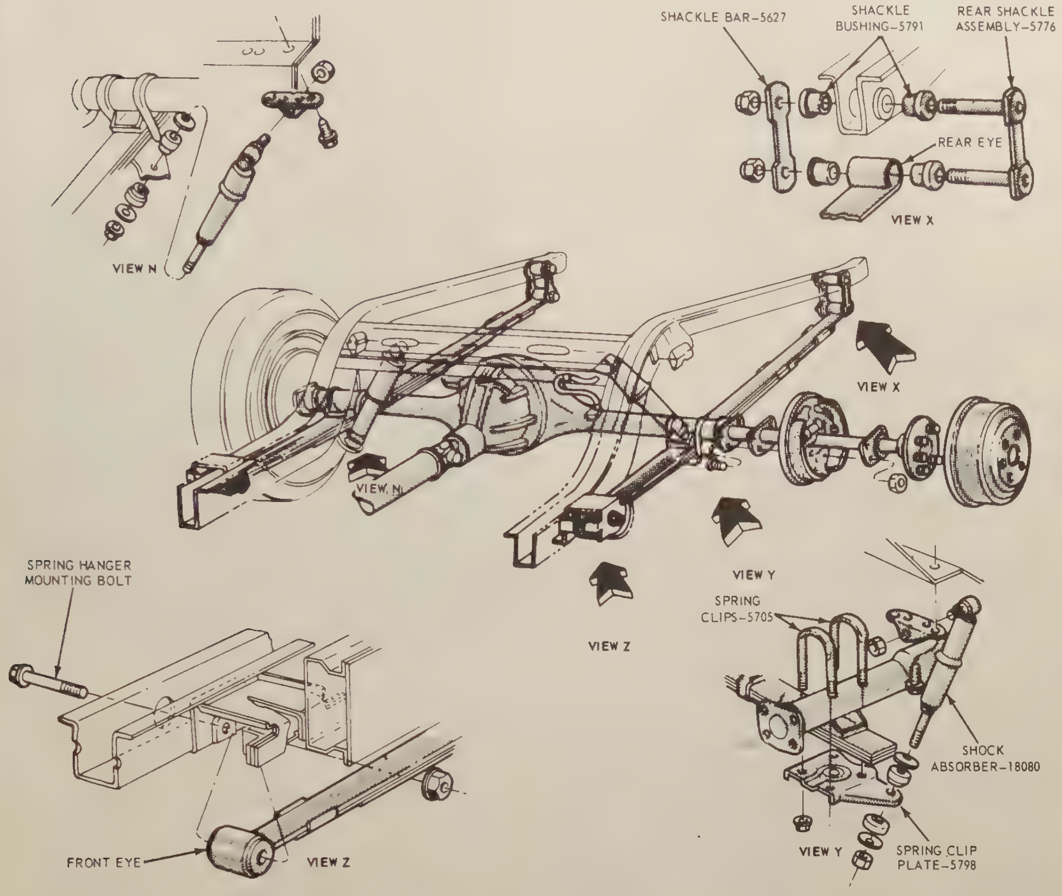
LEAF SPRING

Removal and Installation

1. Raise the vehicle and place supports beneath the underbody and axle.
2. Disconnect the lower end of the shock absorber from the spring clip plate and position it out of the way. Remove the supports from under the axle.
3. Remove the spring plate nuts from the U-bolt and remove the spring plate. With a jack, raise the rear axle just enough to remove the weight of the housing from the spring.
4. Remove the two rear shackle attaching nuts, the shackle bar, and the two inner bushings.
5. Remove the rear shackle assembly and the two outer bushings.
6. Remove the nut from the spring mounting bolt and tap the bolt out of the bushing at the front hanger. Lift out the spring assembly.

NOTE: *All used attaching components (nuts, bolts, etc.) must be discarded and replaced with new ones prior to assembly.*

7. Position the leaf spring under the axle housing and insert the shackle assembly into the rear hanger bracket and the rear eye of the spring.
8. Install the shackle inner bushings, the shackle plate, and the locknuts. Hand-tighten the locknuts.
9. Position the spring eye in the front hanger, slip the washer on the front hanger bolt, and, from the inboard side, insert the bolt through the hanger and eye. Install the locknut on the hanger bolt finger-tight.
10. Lower the rear axle housing so that it rests on the spring. Place the spring plate on the U-bolt and tighten the nuts to 30–45 ft lbs.
11. Attach the lower end of the shock absorber to the spring plate using a new nut.
12. Place jackstands under the rear axle. Lower the vehicle until the spring is in the


SHACKLE BAR-5627
SHACKLE BUSHING-5791
REAR SHACKLE ASSEMBLY-5776
REAR EYE
VIEW X
VIEW N
VIEW X
VIEW N
SPRING HANGER MOUNTING BOLT
VIEW Y
SPRING CLIPS-5705
VIEW Z
SHOCK ABSORBER-18080
FRONT EYE
VIEW Z
VIEW Y
SPRING CLIP PLATE-5798

Rear Suspension Assembly

approximate curb load position (normal riding height), and tighten the front hanger bolt to 80–120 ft lbs.

13. Tighten the rear shackle locknuts to 14–22 ft lbs. Close the hole in the inner rail with a body plug.

14. Remove the jackstands and lower the vehicle.

REAR SHOCK ABSORBER

Removal and Installation

1. Remove the lower end of the shock absorber from the spring plate.

2. Remove the nut retaining the upper end of the shock absorber to the mounting bracket underneath the car.

3. Compress and remove the shock absorber.

NOTE: *All standard equipment shock absorbers are non-refillable and cannot be repaired. Check the shock absorber by wiping it off and extending and compressing it several times. Severe leakage or weak damping action requires replacement. As a general rule, shock absorbers should be replaced in pairs (front and rear sets).*

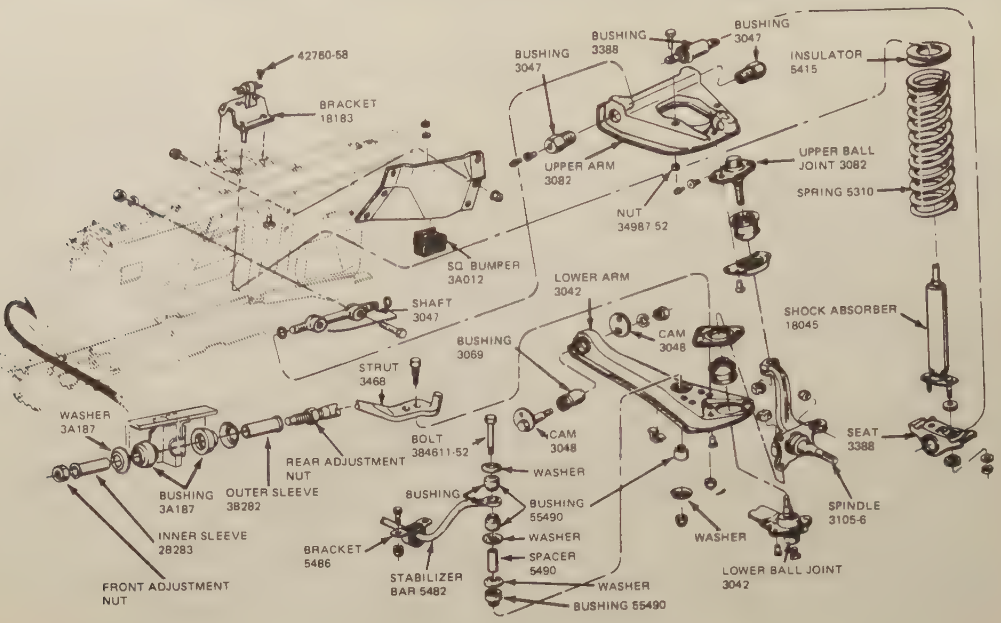
4. Transfer the washers and bushings to the new shock absorber. Insert the upper stud through the mounting bracket, and install the attaching nut finger-tight.

5. Compress and install the shock absorber to the spring plate. Install the washers, bushings, and attaching nuts.

6. Tighten the upper attaching nuts to 45–65 ft lbs and the lower attaching nuts to 14–26 ft lbs.

Front Suspension

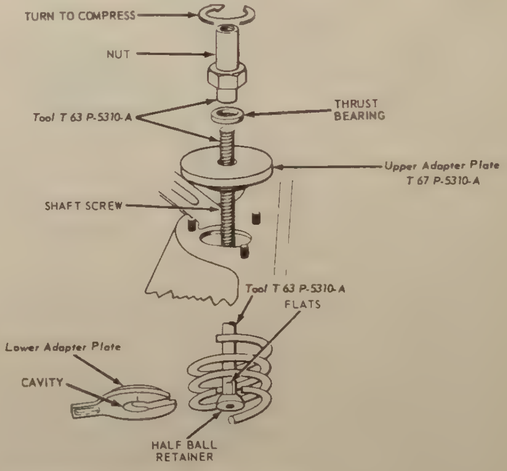
The front wheels rotate on spindles. At the ends of each spindle are an upper and


42760-58
BRACKET 18183
BUSHING 3047
BUSHING 3388
BUSHING 3047
INSULATOR 5415
UPPER ARM 3082
UPPER BALL JOINT 3082
SPRING 5310
NUT 34987 52
SQ BUMPER 3A012
LOWER ARM 3042
SHAFT 3047
SHOCK ABSORBER 18045
CAM 3048
BUSHING 3069
STRUT 3468
WASHER 3A187
BOLT 384611-52
CAM 3048
SEAT 3388
REAR ADJUSTMENT NUT
WASHER
BUSHING
BUSHING 3A187
OUTER SLEEVE 38282
BUSHING 55490
SPINDLE 3105-6
INNER SLEEVE 28283
WASHER
WASHER
BRACKET 5486
SPACER 5490
LOWER BALL JOINT 3042
FRONT ADJUSTMENT NUT
STABILIZER BAR 5482
WASHER
BUSHING 55490

Front Suspension Assembly

lower ball joint which mount into an upper and lower control arm respectively. The upper control arm pivots on a bushing and shaft assembly which is bolted to the body/frame. The lower control arm pivots on a bolt in the no. 2 crossmember. A pair of coil springs are mounted atop the upper control arms, between the upper arm pivot seats and the top of the spring housings. A pair of telescopic shock absorbers are mounted between the pivots seats and the top of the spring housings inside of the coil springs.

A rod-type stabilizing strut mounts between two rubber buffer pads at the front crossmember and each lower control arm. The strut aids the lower end of the spindle through its cycle of vertical movement and serves to cushion the fore and aft thrust of the suspension. A stabilizer bar is used to control front suspension roll.


TURN TO COMPRESS
NUT
Tool T 63 P-5310-A
THRUST BEARING
Upper Adapter Plate T 67 P-5310-A
SHAFT SCREW
Tool T 63 P-5310-A
FLATS
Lower Adapter Plate
CAVITY
HALF BALL RETAINER

Spring Compressor Installation

COIL SPRING

Removal and Installation

CAUTION: *Extreme care must be exercised when removing or installing coil springs. If a spring compressor tool of the proper type is not available, it is advisable that the job be referred to a shop with the proper tool. When a coil spring is released, it will suddenly attempt to reach its unloaded length, before it was installed in a 3,000 lb. automobile, possibly striking you and causing serious injury.*

1. Remove the front shock absorber and upper mounting bracket assembly.

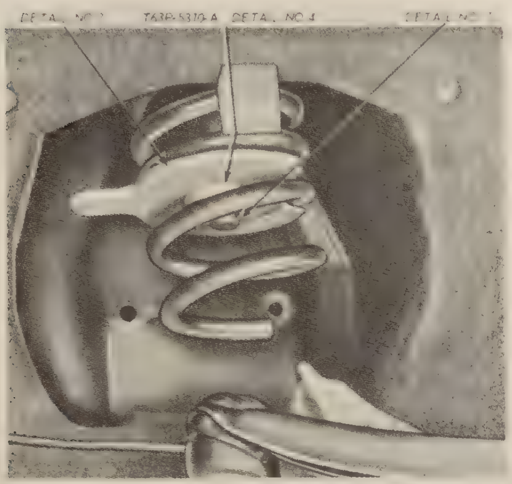
2. Loosen the lug nuts a few turns. Raise the front of the car and place jack stands beneath the inboard end of the lower control arms.

3. Remove the grease cap, cotter pin, nut lock, adjusting nut, and the outer bearing from the hub.

4. On cars equipped with drum front brakes, remove the wheel, hub and drum from the spindle as an assembly. On cars

equipped with disc front brakes, remove the caliper and rotor by following Steps 3 and 5 under "Hub and Disc Assembly Removal and Installation."

5. Install the spring compressor as shown in the illustration.



Compressing Spring—Lower View

6. Remove the two nuts retaining the upper control arm to the spring tower and swing the arms outboard from the tower.

7. Slowly release the spring compressor tool and remove the tool from the spring. Then, remove the spring from the vehicle.

8. To install, tape the spring upper insulator on the top of the spring. Place the spring in the tower. Install the spring compressor and compress the spring.

9. Swing the upper control arm inboard and insert the retaining bolts through the bolt holes in the spring tower. Install the retaining nuts and torque them to 75–100 ft lbs.

10. Slowly release the spring compressor, while guiding the lower end of the spring into the upper control arm spring seat.

NOTE: *The end of the spring must be no more than ½ in. from the tab on the spring seat.*

11. Remove the spring compressor from the vehicle.

12. On cars equipped with drum front brakes, install the wheel, hub and drum on the spindle. On cars equipped with disc front brakes, install the rotor and caliper by following Steps 6, 7 and 8 under "Hub and Disc Assembly Removal and Installation."

13. Install the outer bearing, washer and adjusting nut on the spindle. Adjust the wheel bearing as outlined under "Wheel Bearing Adjustment." Install the locknut, cotter pin, and grease cap.

14. Remove the jack stands and lower the vehicle. Install the shock absorber and upper mounting bracket.

FRONT SHOCK ABSORBER

Removal and Installation

1. Raise the hood. Remove the 3 nuts retaining the shock absorber upper mounting bracket to the spring tower.

2. Jack up the front of the vehicle and install jack stands beneath the lower control arms.

3. Remove the two shock absorber lower retaining nuts, washers, and insulators.

4. Lift the shock absorber and upper mounting bracket assembly from the spring tower. Remove the two bolts retaining the upper bracket to the shock absorber and remove the bracket. Remove the insulators from the lower attaching studs.

5. Check the shock absorber by wiping it clean and extending and compressing it several times. Severe leakage or weak damping action requires replacement. All standard equipment shock absorbers are non-refillable and they cannot be repaired. As a general rule, shock absorbers should be replaced in pairs (front and rear sets).

6. To install, place the upper mounting bracket on the shock absorber and tighten the bolts to 10–16 ft lbs. Install the insulators on the lower attaching studs.

7. Position the shock absorber and upper mounting bracket assembly in the spring tower, making sure that the lower studs are located in the pivot plate holes.

8. Install the two nuts on the shock absorber lower studs and tighten them to 8–12 ft lbs.

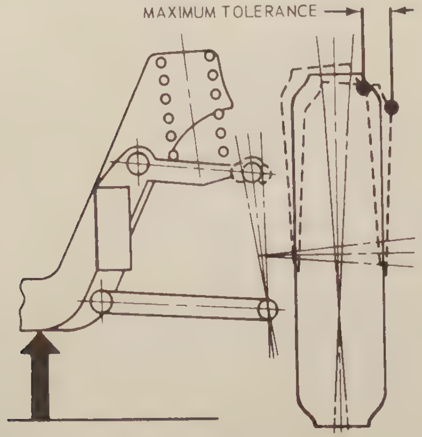
9. Install the 3 nuts retaining the shock absorber upper mounting bracket to the spring tower and torque them to 32–48 ft lbs.

10. Remove the jack stands and lower the vehicle.

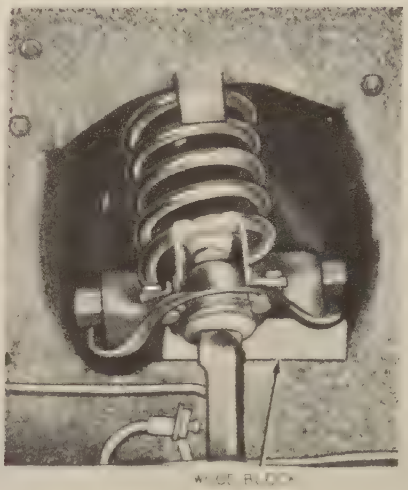
UPPER BALL JOINT

Inspection

1. Raise the vehicle on a hoist or floor jack so that the front wheels hang in the



Measuring Upper Ball Joint Radial Play



Upper Arm Support

full down position. Install jack stands under the crossmember inboard of the lower control arms.

2. Have an assistant grasp the wheel top and bottom and apply alternate in and out pressure to the top and bottom of the wheel.

3. Radial play of ¼ in. is acceptable measured at the inside of the wheel adjacent to the upper arm.

NOTE: *This radial play measurement is multiplied at the outer circumference of the tire and should not be measured here. Measure only at the inside of the wheel.*

NOTE: *On 1972 and later models, Ford recommends that the entire upper control arm be replaced if the ball joint is defective.*

Removal and Installation

1. Position a support between the upper arm and frame rail.

2. Raise the vehicle and remove the tire and wheel.

3. Remove the upper ball joint cotter pin and loosen the nut.

4. Using a suitable tool, loosen the ball joint in the spindle.

5. Remove the 3 ball joint retaining rivets using a large chisel.

6. Remove the nut from the ball joint stud and remove the ball joint.

7. Clean and remove all burrs from the ball joint mounting area of the control arm before installing the new ball joint.

8. Install the ball joint in the upper arm using the service part nuts and bolts (if available). Do not attempt to rivet a new ball joint to the arm.

9. Install and torque the ball joint stud nut to 60 ft lbs. Then tighten the stud nut to the nearest cotter pin slot and install the cotter pin.

10. Lubricate the new joint with a hand grease gun only, using an air pressure gun may loosen the ball joint seal.

11. Install the wheel, lower the vehicle, and remove the upper arm support.

12. Check the front end alignment.

LOWER BALL JOINT

Inspection

The lower ball joint is an integral part of the lower control arm. If the lower ball joint is defective the entire lower control arm must be replaced.

1. Raise the vehicle on a hoist or floor jack so that the front wheel falls to the full down position. Install jack stands under the crossmember inboard of the lower control arms.

2. Have an assistant grasp the bottom of the tire and move the wheel in and out.

3. As the wheel is being moved, observe the lower control arm where the spindle attaches to it.

4. Any movement between the lower part of the spindle and the lower control arm indicates a bad control arm which must be replaced.

NOTE: *During this check, the upper ball joint will be unloaded and may move; this is normal and not an indication of a* *bad ball joint. Also, do not mistake a loose wheel bearing for a worn ball joint.*

LOWER CONTROL ARM

Removal and Installation

1. Position an upper control arm support between the upper arm and the side rail.
2. Raise the vehicle, position jackstands, and remove the wheel and tire.
3. Remove the stabilizer bar-to-link attaching nut and disconnect the bar from the link.
4. Remove the link bolt from the lower arm.
5. Remove the strut bar-to-lower arm attaching nuts and bolts.
6. Remove the lower ball joint cotter pin and back off the nut. Using a suitable tool, loosen the ball joint stud in the spindle.
7. Remove the nut from the arm and lower the arm.
8. Remove the lower arm-to-underbody cam attaching parts and remove the arm.
9. To install, position the lower arm in the underbody and install the ball joint and cam attaching parts loosely.
10. Install the stabilizer and strut and torque the attaching parts to 6–12 ft lbs and 80–115 ft lbs respectively.
11. Torque the lower arm pivot to 75–100 ft lbs and the ball joint stud to 60–90 ft lbs.
12. Lower the car and remove the upper arm support.
13. Front end alignment must be rechecked.

UPPER CONTROL ARM

When upper control arm bushings become low on lubrication, they become very noisy. This can often be corrected by lubrication and it is not necessary to replace the bushings. On early models that do not contain grease plugs it is necessary to drill and tap the bushing to accept a grease fitting. On later models with grease plugs it is difficult to remove the plug and grease the bushing with conventional tools. Ford has available an upper A-arm lubrication kit which greatly eases the performance of this operation.

NOTE: *Because suspension damage to one control arm generally affects the other, it is recommended that upper and lower control arms, and their respective ball joints, be replaced as a unit.*

Removal and Installation

1. Remove the shock absorber and upper mounting bracket from the car as an assembly.
2. Raise the vehicle and remove the wheel and tire as an assembly.
3. Install the spring compressor tool.
4. Place a safety stand under the lower arm.
5. Remove the cotter pin from the upper ball joint stud and loosen the nut.
6. Using a suitable tool, loosen the ball joint in the spindle then, remove the nut and lift the stud from the spindle.
7. Remove the upper arm attaching nuts from the engine compartment and remove the upper arm.
8. To install the arm, position it on the mounting bracket and install the attaching nuts on the inner shaft attaching bolts.

   NOTE: *The original equipment keystone-type lockwashers must be used with the inner shaft attaching nuts and bolts.*
9. Install the upper ball joint stud in the spindle and tighten the nut to 60–90 ft lbs. Install a new cotter pin.
10. Remove the spring compressor and position spring on upper arm. Install wheel and check front end alignment.

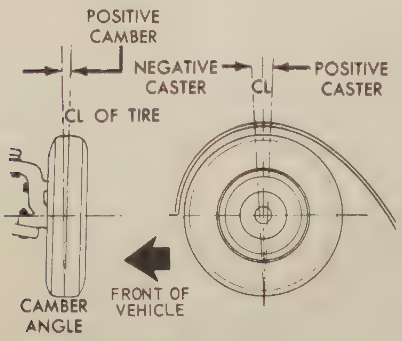
FRONT END ALIGNMENT

NOTE: *The procedure for checking and adjusting front wheel alignment requires specialized equipment and professional skills. The following descriptions and adjustment procedures are for general reference only.*

Front wheel alignment is the position of the front wheels relative to each other and to the vehicle. It is determined, and must be maintained to provide safe, accurate steering with minimum tire wear. Many factors are involved in wheel alignment and adjustments are provided to return those that might change due to normal wear to their original value. The factors which determine wheel alignment are dependent on one another; therefore, when one of the factors is adjusted, the others must be adjusted to compensate.

Descriptions of these factors and their affects on the car are provided below.

NOTE: *Do not attempt to check and adjust the front wheel alignment without first making a thorough inspection of the front suspension components.*



Caster and Camber Angles

CAMBER

Camber angle is the number of degrees that the centerline of the wheel is inclined from the vertical. Camber reduces loading of the outer wheel bearing and improves the tire contact patch while cornering.

CASTER

Caster angle is the number of degrees that a line drawn through the steering knuckle pivots is inclined from the vertical, toward the front or rear of the car. Caster improves directional stability and decreases susceptibility to crosswinds or road surface deviations.

STEERING AXIS INCLINATION

Steering axis inclination is the number of degrees that a line drawn through the steering knuckle pivots is inclined to the vertical, when viewed from the front of the car. This, in combination with caster, is responsible for directional stability and self-centering of the steering. As the steering knuckle swings from lock to lock, the spindle generates an arc, the high point being the straight-ahead position of the wheel. Due to this arc, as the wheel turns, the front of the car is raised. The weight of the car acts against this lift and attempts to return the spindle to the high point of the arc, resulting in self-centering, when the steering wheel is released, and straight-line stability.

TOE-IN

Toe-in is the difference of the distance between the centers of the front and rear of the front wheels. It is most commonly measured in inches, but is occasionally referred to as an angle between the wheels. Toe-in is necessary to compensate for the tendency of the wheels to deflect rearward while in motion. Due to this tendency, the wheels of a vehicle, with properly adjusted toe-in, are traveling straight forward when the vehicle itself is traveling straight forward, resulting in directional stability and minimum tire wear.

Adjustment Procedures

CASTER

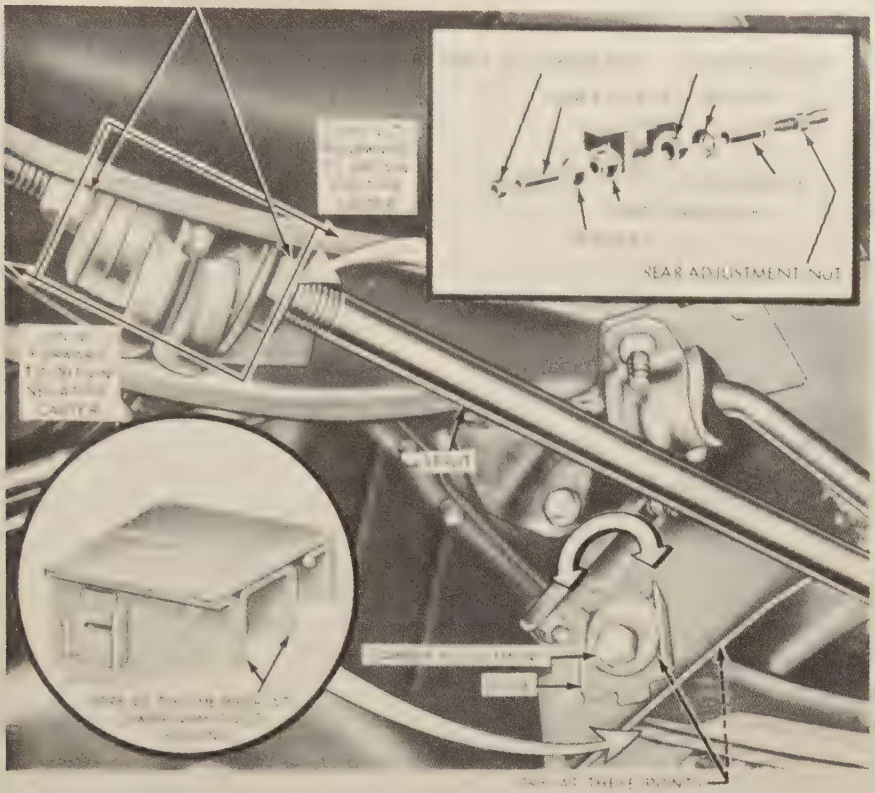
Check the caster angle at each front wheel. The caster angle is the fore-aft tilt of the top of the wheel spindle, as shown in the accompanying diagram. Positive caster exists when the spindle tilts towards the rear; negative caster is present when the spindle tilts towards the front. The correct caster angle should be between −1½° and +½°. When checking, the maximum caster difference between the two front wheels should not exceed 1°. However, if the caster is to be set, the wheels should be set within ½° of each other, with both being in the negative 1½° to positive ½° range.

NOTE: *Because the front suspension angles are interdependent, the preceding specifications assume that camber is also within permissible limits.*

Caster is adjusted by the position of the front suspension strut, shown in the accompanying illustration. Positive caster is obtained by loosening the strut rear nut and tightening the front nut against the bushing. To obtain negative caster, loosen the strut front nut and tighten the rear nut against the bushing. After the caster has been adjusted, always recheck the camber angles.

CAMBER

Check the camber angle at each front wheel. Camber is the angle at which the front wheels are tilted at the top (see accompanying diagram). Positive camber exists when the top of the wheel tilts outward; negative camber is present when the



Caster and Camber Adjustment Procedures

top of the wheel tilts inward. Camber angle should be within the range −½° to +1°, with the maximum camber difference between the front wheels being 1° for checking purposes and ½° for setting purposes. In other words, when setting the camber angles, the two wheels should be within ½° of each other with both being in the range of negative ½° to positive 1°.

The camber adjustment is controlled by the eccentric cam located at the lower arm attachment to the side rail (see accompanying illustration). To adjust the camber, loosen the camber adjustment bolt nut at the rear of the body bracket and spread the body bracket at the camber adjustment bolt area just enough to allow lateral movement of the arm when the adjusting bolt is turned. The bolt and eccentric are rotated clockwise from the high position to increase camber or counterclockwise to decrease camber.

After the caster and camber angles have been adjusted to the proper specifications, tighten the lower arm eccentric bolt nut and the strut front nut securely. Recheck the angles to be sure that they have remained within specifications.

TOE-IN

Before checking and adjusting the toe-in, remove the alignment height spacers used in the caster and camber checks and adjustments. Toe-in should only be checked and adjusted when the caster and camber are within specifications. The toe-in is checked with the front wheels in the straight-ahead position. If the car is equipped with power steering, run the engine so that the power steering control valve will be in the center position. Measure the distance between the extreme front points of the front wheels, then compare this to the distance between the two extreme rear points. The difference between the distances is the amount of toe-in or toe-out of the front wheels. The front wheels should be toed-in (front measurement less than rear measurement) by 1/16 in. to 5/16 in.

Adjustment of the toe-in and the steering wheel spoke position can be accomplished at the same time. When the front wheels are in the straight-ahead position, the steering wheel spokes should be horizontal. Loosen the two clamping bolts on each spindle connecting rod sleeve (see accompanying illustration). If the toe-in is incorrect and the steering wheel spokes are in the proper position, lengthen or shorten both rods equally until the correct toe-in is obtained. If the toe-in is incorrect and the steering wheel position is also incorrect, adjust the rods as necessary to obtain correct toe-in and steering wheel alignment. Check the toe-in and steering wheel position again. If the toe-in is correct, but the steering wheel position is incorrect, turn both connecting rod sleeves upward or downward the same number of turns in order to move the steering wheel to the proper position. When both the toe-in and the steering wheel position are correct, lubricate the clamps, bolts and nuts and tighten the clamping bolts on both sleeves to a torque of 9–15 ft lbs. Be sure that the sleeve position is not changed when the clamping bolts are tightened. Recheck the toe-in and steering wheel position.

Steering

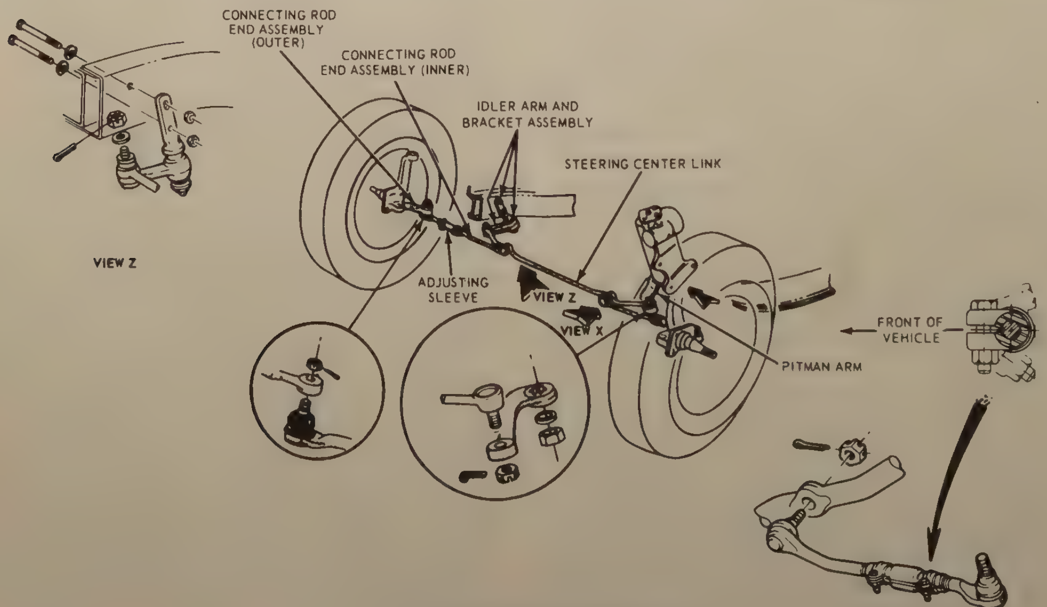
The manual and power steering linkages consist of a pitman arm, arm-to-idler link, idler arm and bracket assembly, and tie rod assemblies with connecting sleeves. The steering gear is of the worm and recirculating ball type, with worm bearing preload controlled by the large adjusting nut threaded onto the housing itself. The sector shaft mesh load is controlled by an adjusting screw in the housing cover. The steering gear identification tag is located under one of the cover securing bolts, and identifies the gear model, service code and serial number or date manufactured.

The power steering system is a hydraulically controlled linkage-type system, and consists of an integral pump and fluid reservoir, control valve, power cylinder, fluid lines and steering linkage. The hydraulic pump, which is driven by belt from the crankshaft, draws fluid from the reservoir and provides pressure for the system. The pump contains a pressure relief valve which governs pressures produced in order to accommodate varying conditions. Fluid returns to the reservoir after passing from the pump to the control valve and power cylinder.

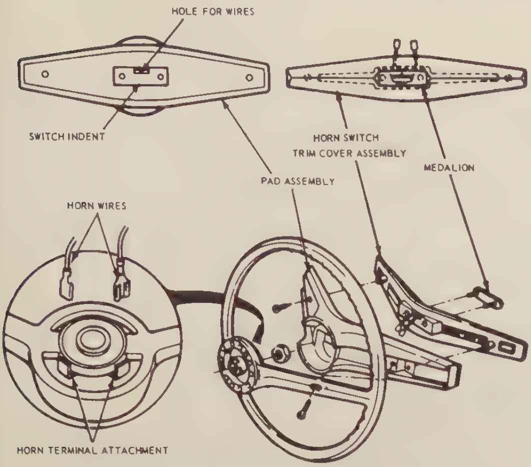
STEERING WHEEL

Removal and Installation

NOTE: *Make sure that the front wheels are pointing straight ahead and the alignment marks on the steering wheel and shaft are aligned prior to removal.*


CONNECTING ROD END ASSEMBLY (OUTER)
CONNECTING ROD END ASSEMBLY (INNER)
IDLER ARM AND BRACKET ASSEMBLY
STEERING CENTER LINK
VIEW Z
ADJUSTING SLEEVE
VIEW Z
VIEW X
FRONT OF VEHICLE
PITMAN ARM
VIEW X

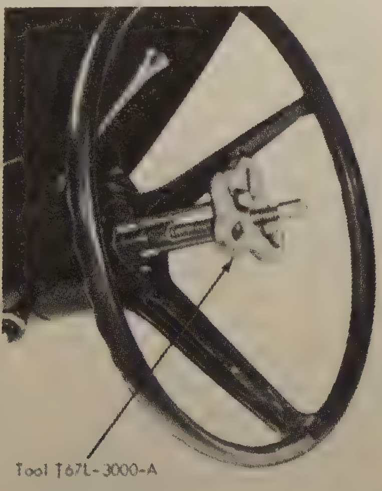
Manual Steering Linkage



Typical Two-Spoke Wheel and Horn Switch

1. Disconnect the negative battery cable.
2. Working from underside the steering wheel spoke, remove the crash pad retaining screws and lift the pad from the wheel. On models equipped with a center mounted horn button (hub), rotate the button (hub) counterclockwise ½ turn and lift it from the wheel.
3. Disconnect the horn wires.
4. Remove the steering wheel nut. Using a steering wheel puller, such as the one pictured in the illustration, remove the steering wheel from the shaft.

   CAUTION: *Do not use a knock-off type steering wheel puller or strike the end of the steering shaft with a hammer. Either procedure may damage the steering shaft bearing or may collapse the steering column.*
5. Transfer all serviceable parts to the new steering wheel (if applicable).



Removing Steering Wheel

6. Position the steering wheel on the steering shaft so that the marks on the wheel and shaft are properly aligned. Check again that the front wheels are pointing straight ahead, and that the steering wheel is in the normal position.
7. Install a new steering wheel nut and torque to 30–40 ft lbs. Connect the horn wires. Install the crash pad and screws, or the center hub (rotate clockwise).
8. Connect the negative battery cable and test the horn and steering column for proper operation.

TURN SIGNAL AND HAZARD FLASHER SWITCH ASSEMBLY

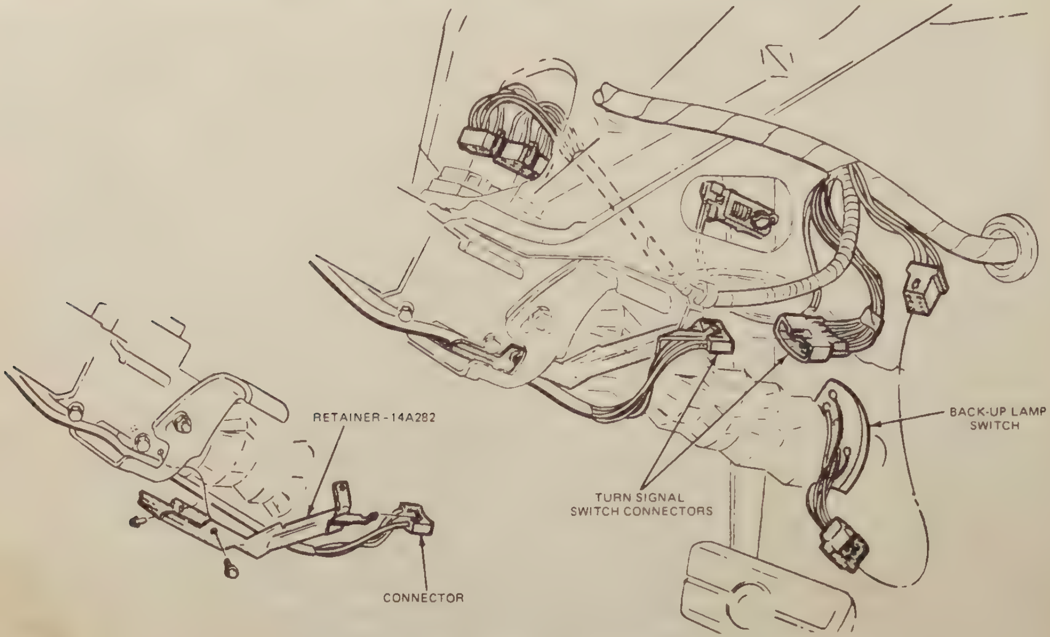
Removal and Installation

1. Follow Steps 1–4 under "Steering Wheel Removal and Installation."
2. Unscrew the turn signal switch lever from the steering column.
3. Remove the shroud from beneath the column.
4. Disconnect the steering column wiring connector plug from the bracket under the dash above the steering column. Remove the 3 screws retaining the turn signal/hazard flasher switch to the column.
5. Carefully pull the wires and connector plug up through the hole in the flange casting and remove the switch.
6. To install, route the wires and plug through the top of the column, so that they come out below the flange casting. Secure the switch to the column with the 3 retaining screws.
7. Connect the plug to its mating plug at the lower end of the column.
8. Install the shroud and turn signal lever on the steering column.
9. Install the steering wheel as outlined under Steps 6, 7, and 8 of "Steering Wheel Removal and Installation."
10. Test the operation of the turn signals and hazard flashers.

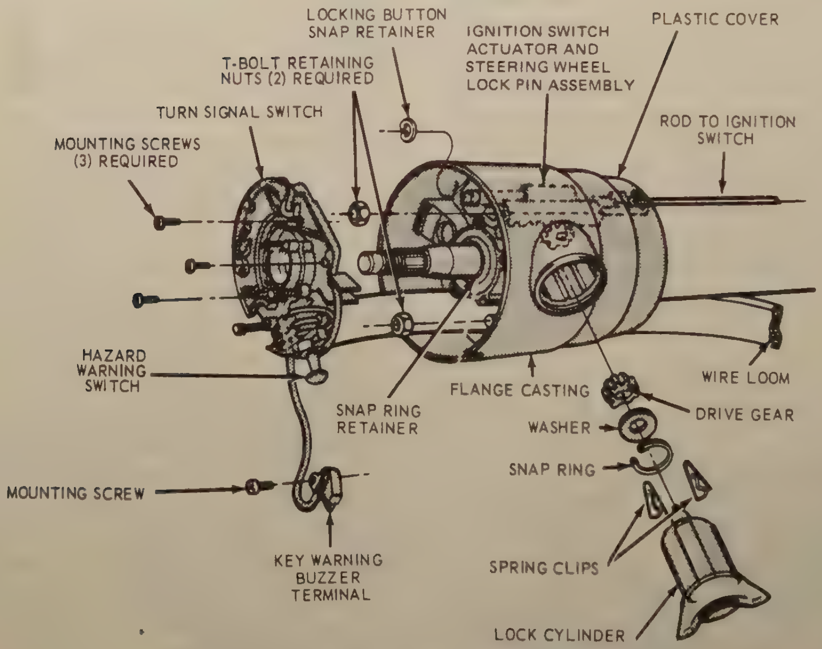
MANUAL STEERING

Steering Gear Inspection

Before any steering gear adjustments are made, it is recommended that the front end of the car be raised and a thorough inspection be made for stiffness or lost motion in the steering gear, steering linkage, and front suspension. Worn or damaged parts should


RETAINER - 14A282
CONNECTOR
TURN SIGNAL SWITCH CONNECTORS
BACK-UP LAMP SWITCH

Column Wire Connectors


LOCKING BUTTON SNAP RETAINER
T-BOLT RETAINING NUTS (2) REQUIRED
TURN SIGNAL SWITCH
MOUNTING SCREWS (3) REQUIRED
IGNITION SWITCH ACTUATOR AND STEERING WHEEL LOCK PIN ASSEMBLY
PLASTIC COVER
ROD TO IGNITION SWITCH
HAZARD WARNING SWITCH
SNAP RING RETAINER
FLANGE CASTING
WIRE LOOM
DRIVE GEAR
WASHER
SNAP RING
MOUNTING SCREW
KEY WARNING BUZZER TERMINAL
SPRING CLIPS
LOCK CYLINDER

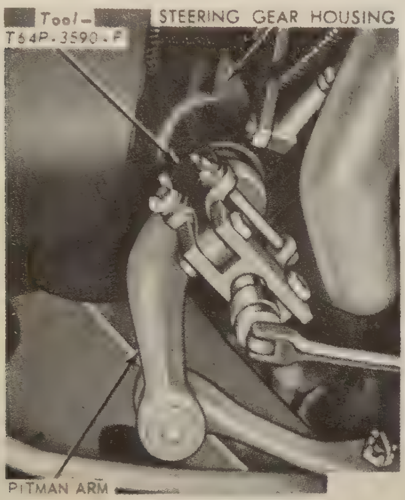
Turn Signal/Hazard Flasher Switch and Related Parts

be replaced, since a satisfactory adjustment of the steering gear cannot be obtained if bent or badly worn parts exist.

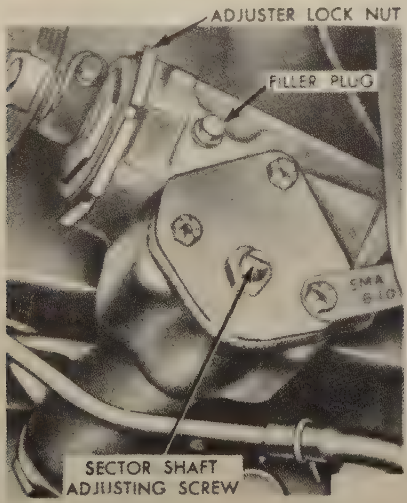
It is also very important that the steering gear be properly aligned in the car. Misalignment of the gear places a stress on the steering worm shaft, therefore a proper adjustment is impossible. To align the steering gear, loosen the mounting bolts to permit the gear to align itself. Check the steering gear mounting seat and if there is a gap at any of the mounting bolts, proper alignment may be obtained by placing shims where excessive gap appears. Tighten the steering gear bolts. Alignment of the gear in the car is very important and should be done carefully so that a satisfactory, trouble-free gear adjustment may be obtained.

Worm and Sector Gear Adjustments

The ball nut assembly and the sector gear must be adjusted properly to maintain a minimum amount of steering shaft end-play and a minimum amount of backlash between the sector gear and the ball nut. There are only two adjustments that may be done on this steering gear and they should be done as given below:



Disconnecting Pitman Arm



Steering Gear Adjustments

1. Disconnect the pitman arm from the steering pitman-to-idler arm rod.
2. Loosen the locknut on the sector shaft adjustment screw and turn the adjusting screw counterclockwise.
3. Measure the worm bearing preload by attaching an in. lbs torque wrench to the steering wheel nut. With the steering wheel off center, note the reading required to rotate the input shaft about 1½ turns to either side of center. If the torque reading is not about 4–5 in. lbs, adjust the gear as given in the next step.
4. Loosen the steering shaft bearing adjuster locknut and tighten or back off the bearing adjusting screw until the preload is within the specified limits.
5. Tighten the steering shaft bearing adjuster locknut and recheck the preload torque.
6. Turn the steering wheel slowly to either stop. Turn *gently* against the stop to avoid possible damage to the ball return guides. Then rotate the wheel 2¾ turns to center the ball nut.
7. Turn the sector adjusting screw clockwise until the proper torque (9–10 in. lbs) is obtained that is necessary to rotate the worm gear past its center (high spot).
8. While holding the sector adjusting screw, tighten the sector screw adjusting locknut to 32–40 ft lbs and recheck the backlash adjustment.
9. Connect the pitman arm to the steering arm-to-idler arm rod.

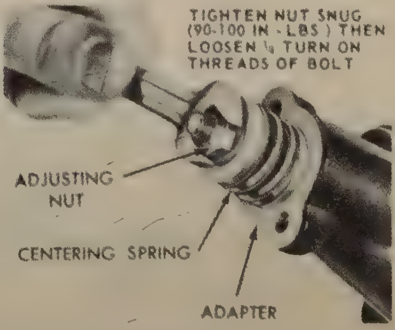
POWER STEERING

Power Steering System Adjustments

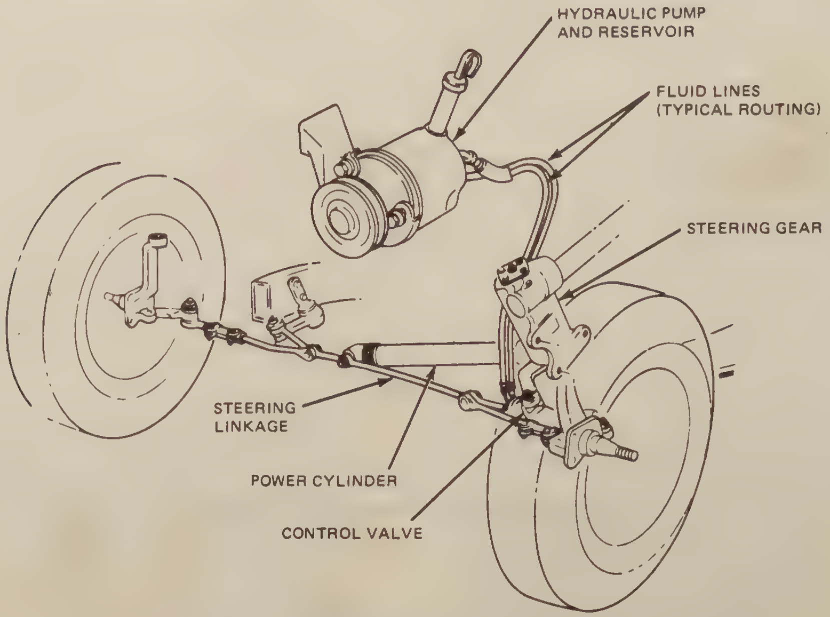
Control Valve Centering Spring Adjustment

1. Raise the car and install safety stands. Remove the spring cap attaching screws and the spring cap.

CAUTION: *Be very careful not to position the hoist adaptors of two-post hoists under the suspension and/or steering components. Place the hoist adaptors under the front suspension lower arms.*


TIGHTEN NUT SNUG (90-100 IN-LBS) THEN LOOSEN ¼ TURN ON THREADS OF BOLT
ADJUSTING NUT
CENTERING SPRING
ADAPTER

Adjusting Centering Spring


HYDRAULIC PUMP AND RESERVOIR
FLUID LINES (TYPICAL ROUTING)
STEERING GEAR
STEERING LINKAGE
POWER CYLINDER
CONTROL VALVE

Non-Integral Power Steering System—250 Six-Cylinder Engine Shown

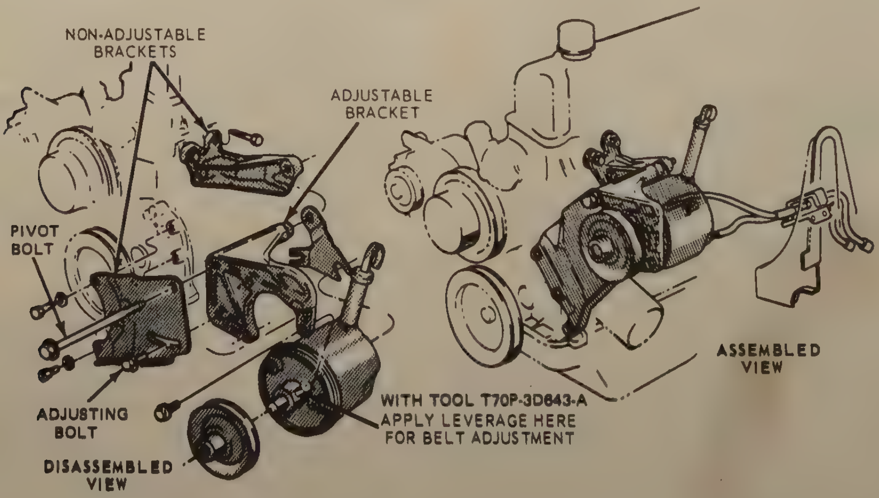
2. Tighten the adjusting nut snugly (about 90–100 in lbs); then loosen the nut ¼ turn (90°). Do not tighten the adjusting nut too tightly.

3. Place the spring cap on the valve housing. Lubricate and install the attaching screws and washers. Tighten the screws to 72–100 in. lbs.

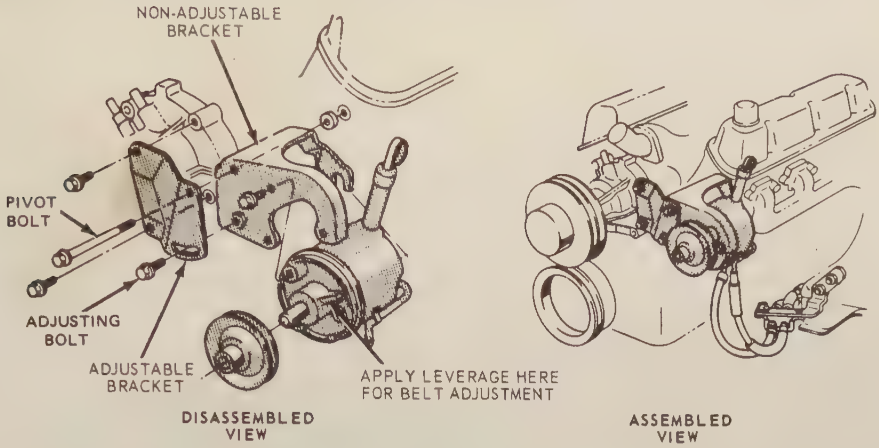
4. Lower the car and start the engine. Check the steering effort using a spring scale attached to the steering wheel rim for a torque of more than 12 lbs.

Power Steering Pump

The Ford-Thompson power steering pump is a belt-driven, constant-displacement until that uses a number of spring-loaded slippers in the pump rotor to force oil from the inlet side to the control valve. Openings in the metering pin allow a flow of approximately 2 gal/min of fluid to the steering gear before the flow control valve directs the excess fluid to the inlet side of the pump again. Maximum pressure in the pump is limited by the pressure relief


NON-ADJUSTABLE BRACKETS
ADJUSTABLE BRACKET
PIVOT BOLT
ADJUSTING BOLT
DISASSEMBLED VIEW
ASSEMBLED VIEW
WITH TOOL T70P-3D643-A APPLY LEVERAGE HERE FOR BELT ADJUSTMENT

Power Steering Pump Installation—200 Six-Cylinder Engine



Power Steering Pump Installation—302 V8 Engine

valve which opens when the fluid pressure exceeds the maximum pressure limits.

Removal and Installation

1. Drain the fluid from the pump reservoir by disconnecting the fluid return hose at the pump. Then, disconnect the pressure hose from the pump.
2. Remove the mounting bolts from the front of the pump. On eight-cylinder engines, there is a nut on the rear of the pump that must be removed. After removal, move the pump inward to loosen the belt tension and remove the belt from the pulley. Then, remove the pump from the car.
3. To reinstall the pump, position it on the mounting bracket and loosely install the mounting bolts and nuts. Put the drive belt over the pulley and move the pump outward against the belt until the proper belt tension is obtained. Measure the belt tension with a belt tension gauge for the proper adjustment. Only in cases where a belt tension gauge is not available should the belt deflection method be used. If the belt deflection method is used, be sure to check with a belt tension gauge as soon as possible, since the deflection method is not accurate.
4. Tighten the mounting bolts and nuts to the specified torque.
5. Tighten the pressure hose fitting hex nut to the proper torque. Then, connect the pressure hose to the pump and tighten the hose nut to the proper torque.
6. Connect the fluid return hose to the pump and tighten the clamp.
7. Fill the pump reservoir with power steering fluid and bleed the air bubbles from the system.
8. Check for leaks and recheck the fluid level. If necessary, add fluid to the proper level.

Wheel Alignment

		CASTER		*CAMBER*				*WHEEL PIVOT RATIO (deg)*	
Year	*Model*	*Range (deg)*	*Pref. Setting (deg)*	*Range (deg)*	*Pref. Setting (deg)*	*Toe-in (in.)*	*Steering Axis Inclination (deg)*	*Inner Wheel*	*Outer Wheel*
1970–71	All	1½N to ½P	½N	½N to ¼P	¼P	1/16 to 5/16	6¾	20	18¾ ①
1972–74	All	2½N to 1½P	½N	¾N to 1¼P	¼P	1/16 to ⅜	6¾	20	18½ ①
1975–76	All	1¼N to ¼P	½N	½N to 1P	¼P	0 to ⅜	6¾	20	18⅓ ②

① Models with power steering—18⅕

② Models with power steering—18⅛

9 · Brakes

Hydraulic System

All Mavericks and Comets utilize a dual hydraulic brake circuit in accordance with Federal safety regulations. Each circuit is independent of the other, incorporating a tandem master cylinder, a pressure differential warning valve, and, on disc brake models, a proportioning valve. One circuit services the front brakes (rear of master cylinder) and the other, the rear brakes (front of master cylinder). In case of a leak or other hydraulic failure, ½ braking efficiency will be maintained. A brake system failure will decentralize the pressure differential warning valve, actuating a warning light on the dash. A proportioning valve located between the rear brake system inlet and outlet ports in the pressure differential warning valve serves to regulate the rear brake hydraulic pressure on disc brake models to prevent premature rear wheel lockup during hard braking.

In normal operation, the hydraulic system functions as follows:

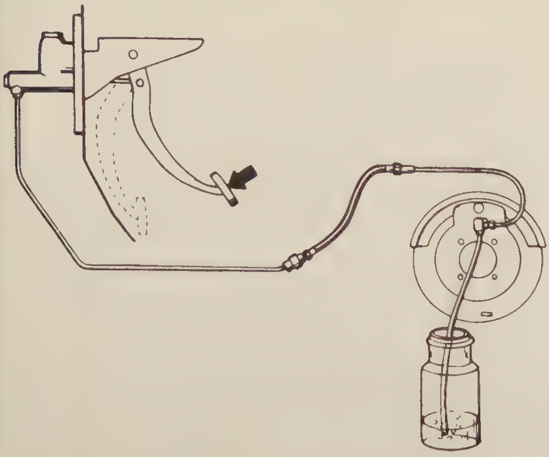
When the brake pedal is depressed, the master cylinder pistons move forward, displacing the brake fluid. Due to the fact that the fluid volume is constant, the displacement results in increased hydraulic pressure. This pressure is exerted upon the wheel cylinders and/or caliper pistons, thus forcing the brake shoes or friction pads against the drums or discs.

When the brake pedal is released, hydraulic pressure drops. On drum brakes, the brake return springs, and on disc brakes, the wobbling action of the disc returns the shoes or disc pads to their retracted positions and force the displaced fluid back into the master cylinder. On disc brakes, in addition to the wobbling action of the disc, the piston seals retracting from their stretched position help return the disc pads to their released position.

BLEEDING

NOTE: *The front and rear hydraulic systems are independent. If it is known that only one system has air in it, only that system has to be bled. Always bleed the brakes in a sequence that starts with the wheel cylinder farthest from the master cylinder and ends with the wheel cylinder or caliper closest to the master cylinder.*

1. Fill the master cylinder with brake fluid.
2. Install a ⅜ in. box-end wrench to the bleeder screw on the right rear wheel.
3. Push a piece of small-diameter rubber tubing over the bleeder screw until it is flush against the wrench. Submerge the other end of the rubber tubing in a glass jar partially fill with clean brake fluid.



Bleeding Brake System

Make sure the rubber tube fits on the bleeder screw snugly.

4. Have a friend apply pressure to the brake pedal. Open the bleeder screw and observe the bottle of brake fluid. If bubbles appear in the glass jar, there is air in the system. When your friend has pushed the pedal to the floor, immediately close the bleeder screw before he releases the pedal.

5. Repeat this procedure until no bubbles appear in the jar. Refill the master cylinder.

6. Repeat this procedure on the left rear, right front and left front wheels, in that order. Periodically refill the master cylinder so that it does not run dry.

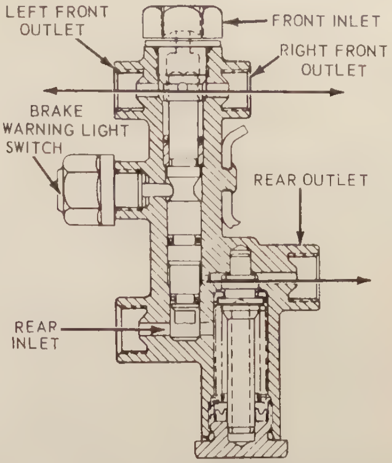
7. Center the pressure differential warning valve as outlined in the "Pressure Differential Warning Valve" section.

PRESSURE DIFFERENTIAL WARNING VALVE

Centering

Since the introduction of dual master cylinders to the hydraulic brake system, a pressure differential warning signal has been added. This signal consists of a warning light on the dashboard activated by a differential pressure switch located below the master cylinder. The signal indicates a hydraulic pressure differential between the front and rear brakes of 80–150 psi, and should warn the driver that a hydraulic failure has occurred.

After repairing and bleeding any part of the hydraulic system the warning light may remain on due to the pressure differential valve remaining in the off-center position. To centralize the valve a pressure difference must be created in the opposite branch of the hydraulic system that was repaired or bled last.



Sectional View of Pressure Differential Valve

NOTE: *Front wheel balancing of cars equipped with disc brakes may also cause a pressure differential in the front branch of the system.*

To centralize the valve:

1. Turn the ignition to either the "acc" or "on" position.

2. Check the fluid level in the master cylinder reservoirs. Fill to within ¼ in. of the top if necessary.

3. Depress the brake pedal firmly. The valve will centralize itself causing the brake warning light to go out.

4. Turn the ignition off.

5. Prior to driving the vehicle, check the operation of the brakes and obtain a firm pedal.

MASTER CYLINDER

Removal and Installation

1. Working from inside the car below the instrument panel, disconnect the master cylinder pushrod from the brake pedal assembly. The pushrod cannot be removed from the master cylinder.

2. Disconnect the stoplight switch wires at the connector. Remove the spring retainer. Slide the stoplight switch off the brake pedal pin just far enough to clear the end of the pin, then lift and remove the switch from the pin. Take care not to damage the switch during removal.

3. Loosen the master cylinder attaching nuts from inside the engine compartment. Slide the master cylinder pushrod, nylon washers and bushings off the brake pedal pin.

4. Remove the brake tubes from the primary and secondary outlet ports of the master cylinder, and mark them for reassembly.

5. Remove the locknuts and lockwashers securing the master cylinder to the dash and lift the cylinder forward and upward from the car.

6. To install, position the rubber boot on the pushrod and secure the boot to the master cylinder. Carefully insert the boot through the dash panel opening and position the master cylinder and master cylinder mounting gasket (if so equipped) on the dash panel studs.

7. Install the attaching nuts and leave them loose.

8. Coat the nylon bushings with light (10W) engine oil. Install the nylon washer and bushing on the brake pedal pin.

9. Position the stoplight switch and pushrod on the brake pedal pin. Install the nylon bushing and washer and secure them in position with the spring retainer.

10. Connect the wires at the stoplight switch connector.

11. Tighten the master cylinder attaching nuts and connect the brake lines at the master cylinder.

12. Fill the master cylinder with brake fluid meeting SAE 70R3 specifications to within ¼ in. of the top of the dual reservoirs.

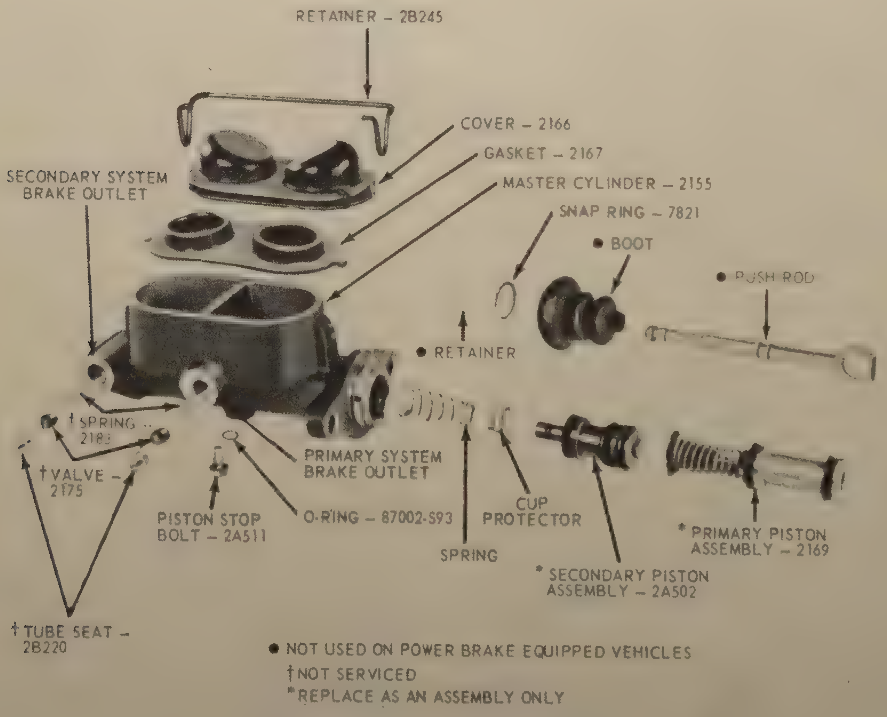
13. Bleed the master cylinder and both the primary and secondary brake hydraulic systems as outlined under "Hydraulic System Bleeding."

14. Centralize the pressure differential valve as outlined under "Differential Valve Centering."

15. Operate the brakes several times and check for any leakage.

Overhaul

Referring to the accompanying exploded view of the dual master cylinder components, disassemble the unit as follows: Clean the exterior of the cylinder and remove the filler cover and diaphragm. Any brake fluid remaining in the cylinder should be poured out and discarded. Remove the secondary piston stop bolt from


RETAINER – 2B245
COVER – 2166
GASKET – 2167
MASTER CYLINDER – 2155
SNAP RING – 7821
● BOOT
● PUSH ROD
SECONDARY SYSTEM BRAKE OUTLET
● RETAINER
† SPRING – 2183
† VALVE – 2175
PISTON STOP BOLT – 2A511
O-RING – 87002-S93
PRIMARY SYSTEM BRAKE OUTLET
SPRING
CUP PROTECTOR
* SECONDARY PISTON ASSEMBLY – 2A502
* PRIMARY PISTON ASSEMBLY – 2169
† TUBE SEAT – 2B220
● NOT USED ON POWER BRAKE EQUIPPED VEHICLES
† NOT SERVICED
* REPLACE AS AN ASSEMBLY ONLY

Dual Master Cylinder Disassembled

the bottom of the cylinder and remove the bleed screw, if required. With the primary piston depressed, remove the snap-ring from its retaining groove at the rear of the cylinder bore. Withdraw the pushrod and the primary piston assembly from the bore.

NOTE: *Do not remove the screw that retains the primary return spring retainer, return spring, primary cup and protector on the primary piston. The assembly is adjusted at the factory and should not be disassembled.*

Remove the secondary piston assembly.

NOTE: *Do not remove the outlet tube seats, outlet check valves and outlet check valve springs from the cylinder body.*

All components should be cleaned in clean isopropyl alcohol or clean brake fluid and inspected for chipping, excessive wear and damage. Check to ensure that all recesses, openings and passageways are clear and free of foreign matter. Dirt and cleaning solvent may be removed by using compressed air. After cleaning, keep all parts on a clean surface. Inspect the cylinder bore for etching, pitting, scoring or rusting. If necessary, the cylinder bore may be honed to repair damage, but never to a diameter greater than the original diameter plus .003 in.

During the assembly operation, be sure to use all parts supplied with the master cylinder repair kit. With the exception of the master cylinder body, submerge all parts in extra heavy duty brake fluid. Carefully insert the complete secondary piston and return spring assembly into the cylinder bore and install the primary piston assembly into the bore. With the primary piston depressed, install the snap-ring into its groove in the cylinder bore. Install the pushrod, boot and retainer (if equipped), then install the pushrod assembly into the primary piston. Be sure that the retainer is properly seated and is holding the pushrod securely. Position the inner end of the pushrod boot (if equipped) in the master cylinder body retaining groove. Install the secondary piston stop bolt and O-ring at the bottom of the master cylinder body. Install the bleed screw (if equipped) and position the gasket on the master cylinder filler cover. Be sure that the gasket is securely seated. Install the cover and secure with the retainer.

Brake Diagnosis Chart

Condition	*Mechanical*	*Hydraulic*	*Vacuum (Power Unit)*
Low Pedal (Excessive pedal travel to apply brakes)	FGIMfg	T	k
Spongy Pedal (A springy sensation of pedal upon application)	I	PQU	
Hard Pedal (Excessive pedal pressure needed to stop vehicle)	AFGKVaf	RTUW	cehk
Fading Pedal (A falling away of pedal under steady foot pressure)	I	PQSTW	
Grabbing or Pulling	ABEGHIK LNVXYZa	RW	k
Noise (Squealing, clicking or scraping noise)	FGHIL MN		
Chatter or Shudder (May be accompanied by brake roughness or pedal pumping)	DGILNO		
Dragging Brakes (Slow or incomplete release of brakes)	ABCFGH KLVafg	RUTW	k

A. Pedal linkage binding. (Check by bleeding one wheel cylinder using light pedal effort. Observe for smooth full travel of pedal.)
B. Parking brake cables and linkage sticking, dirty, or corroded.
C. Parking brake improperly adjusted (too loose or too tight).
D. Wheel bearings loose.
E. Front wheel alignment or uneven tire tread.
F. Brake shoes improperly adjusted. Automatic adjuster parts corroded, distorted, or broken.
G. Brake linings or disc pads worn, contaminated, or distorted.
H. Shoe return spring weak, broken, or improperly installed.
I. Drums cracked, thin (beyond 0.060 in. or original specifications), scored, hard spotted, or out of round.

K. Brake support plate ledges rusted or grooved.
L. Support plate loose, worn, or distorted.
M. Disc brake pad "knock back" (loose or worn wheel bearings or steering parts).
N. Caliper not aligned with dsic or loose.
O. Disc has excessive lateral run-out. Excessively out of parallel.
P. Hydraulic system fluid has air in it, improper quality (low boiling point).
Q. Hoses and lines soft or weak (expanding under pressure).
R. Hoses and lines kinked, collapsed, dented, or clogged.
S. Hoses and lines loosely connected, ruptured, or damaged (causing leakage).
T. Master cylinder primary cup worn or damaged, bore worn, rough, corroded.
U. Master cylinder check valve faulty or compensator port blocked.
V. Wheel or caliper cylinder pistons frozen or seized.
W. Wheel or caliper cylinder cups frozen or worn, or damaged seals; bores rough or corroded.
X. Wheel or caliper cylinders mismatched (size).
Y. Check tire pressure.
Z. Rear wheels (both) grabbing. Rear brake line proportioning valve defective—replace.
a. Power unit valve rod linkage binding.
c. Vacuum lines loose, broken, collapsed. Engine vacuum low.
e. Vacuum check valve defective or sticking.
f. Power unit hydraulic pushrod improperly adjusted.
g. Air trapped in hub cavity of master cylinder. Inspect and remove master cylinder boot if installed.
h. Air filter dirty, clogged.
k. Corrosion or lack of lubrication in power cylinder. Control valve, power cylinder, piston, or diaphragm defective.

Brake System

Self-adjusting, internal expanding duo-servo drum brakes are standard equipment on all 1970–75 Maverick and Comets. Sliding caliper front disc brakes are available as optional equipment on 1974–75 models and standard on 1976 models. Power assist is used on disc brake models.

Drum Brakes

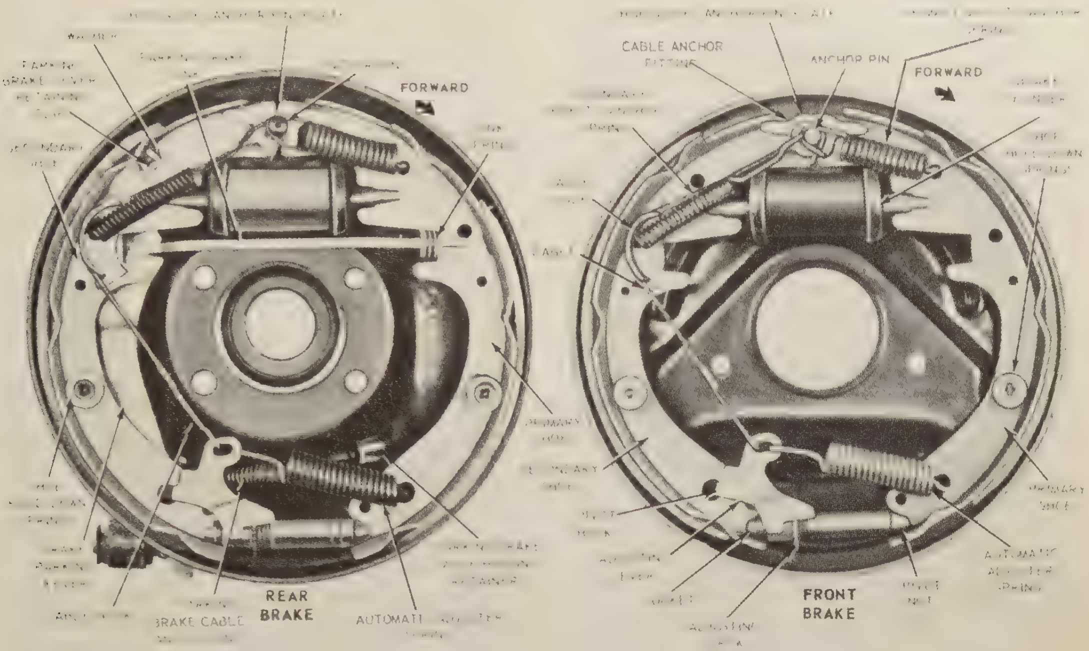
Drum brakes on all Mavericks and Comets employ single-anchor, internal-expanding, and self-adjusting brake assemblies. The automatic adjuster continuously maintains correct operating clearance between the linings and the drums by adjusting the brake in small increments in direct proportion to lining wear. When applying the brakes while backing up, the linings tend to follow the rotating drum counterclockwise, thus forcing the upper end of the primary shoe against the anchor pin. Simultaneously, the wheel cylinder pushes the upper end of the secondary shoe and cable guide outward, away from the anchor pin. This movement of the secondary shoe causes the cable to pull the adjusting lever upward and against the end of the tooth on the adjusting screw starwheel. As lining wear increases, the upward travel of the adjusting lever also increases. When the linings have worn sufficiently to allow the lever to move upward far enough, it passes over the end of the tooth and engages it. Upon release of the brakes, the adjusting spring pulls the adjuster lever downward, turning the starwheel and expanding the brakes.

Inspection

1. Raise the front or rear of the car and support the car with safety stands. Make sure that the parking brake is not on.

2. If you are going to check the rear brakes, remove the lug nuts that attach the wheels to the axle shaft and remove the tires and wheels from the car. Using a pair of pliers, remove the tinnerman nuts from the wheel studs. Pull the brake drum off the axle shaft. If the brakes are adjusted too tightly to remove the drum, see Step 4. If you can remove the drum, see Step 5.

3. If you are going to check the front brakes, then the front tire, wheel and brake drum can be removed as an assembly. Remove the hub cap, then either pry the dust cover off the spindle with a screwdriver or pull it off with a pair of channel-lock pliers. Remove the cotter pin from the spindle. Slide the nut lock off the adjusting nut, then loosen the adjusting nut until it reaches the end of the spindle. Do not remove the adjusting nut yet. Grab the tire and pull it out toward yourself, then push it back into position. This will free the outer wheel bearing from the drum hub. If the brakes are adjusted up too tightly to allow the drum to be pulled off them, go to Step 4 and loosen up the brakes, then return here. Remove the adjusting nut, washer and outer bearing from

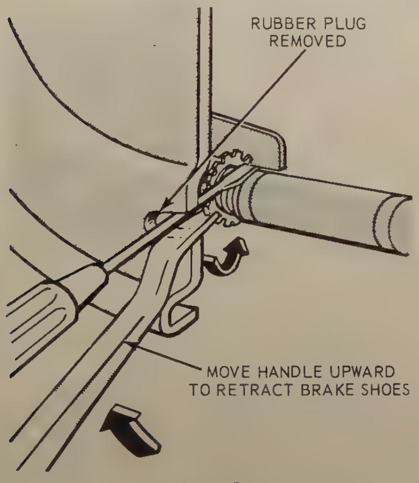

FORWARD
REAR BRAKE
BRAKE CABLE
AUTOMATI
CABLE ANCHOR FITTING
ANCHOR PIN
FORWARD
FRONT BRAKE

Drum Brake Assemblies

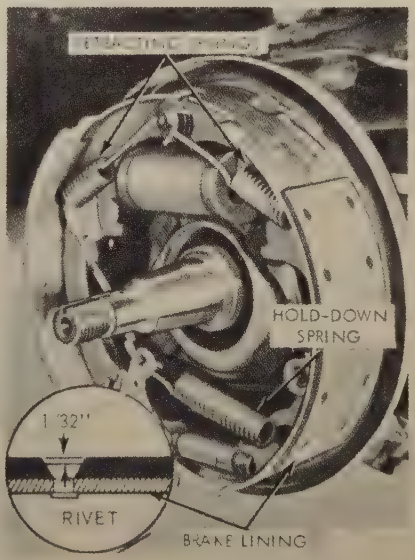
the spindle. Pull the tire, wheel, and brake drum off the spindle.

4. If the brakes are too tight to remove the drum, get under the car (make sure that you have safety stands under the car to support it) and remove the rubber plug from the bottom of the brake backing plate. Shine a flashlight into the slot in the plate. You will see the top of the adjusting screw starwheel and the adjusting lever for the automatic brake adjusting mechanism. To back off on the adjusting screw, you must first insert a small, thin screwdriver or a piece of firm wire (coat-hanger wire) into the adjusting slot and push the adjusting lever away from the adjusting screw. Then, insert a brake adjusting spoon into the slot and engage the top of the starwheel. Lift up on the bottom of the adjusting spoon to force the adjusting screw starwheel downward. Repeat this operation until the brake drum is free of the brake shoes and can be pulled off.

5. Clean the brake shoes and the inside of the brake drum. There must be at least

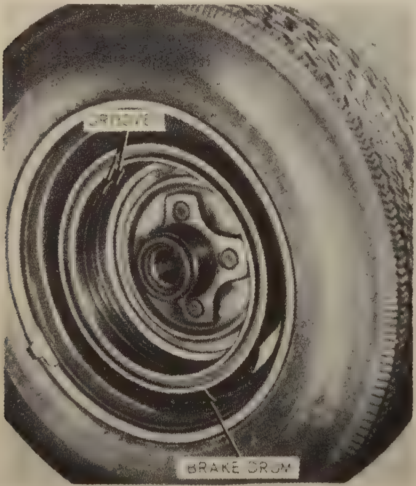

RUBBER PLUG REMOVED
MOVE HANDLE UPWARD TO RETRACT BRAKE SHOES

Backing Off Drum Brake Adjustment


HOLD-DOWN SPRING
1/32"
RIVET
BRAKE LINING

Inspecting Linings for Wear

1/16 in. of brake lining above the heads of the brake shoe attaching rivets. The lining should not be cracked or contaminated with grease or brake fluid. If there is grease or brake fluid on the lining, it must be replaced and the source of the leak must be found and corrected. Brake fluid on the lining means leaking wheel cylinders. Grease on the brake lining means a leaking grease retainer (front wheels) or axle seal (rear brakes). If the lining is slightly glazed but otherwise in good condition, it can be cleaned up with medium sandpaper. Lift up the bottom of the wheel cylinder boots and inspect the ends of the wheel cylinders. A small amount of fluid in the end of the cylinders should be considered normal. If fluid runs out of the cylinder when the boots are lifted, however, the wheel cylinder must be rebuilt or replaced. Examine the inside of the brake drum; it should have a smooth, dull finish. If excessive brake shoe wear caused grooves to wear in the drum it must be machined or replaced. If the inside of the drum is slightly glazed, but otherwise good, it can be cleaned up with medium sandpaper.



Checking for Grooves in Brake Drum

6. If no repairs are required, install the drum and wheel. If the brake adjustment was changed to remove the drum, adjust the brakes until the drum will just fit over the brakes. After the wheel is installed it will be necessary to complete the adjustment. See "Brake Adjustment" later in this chapter. If a front wheel was removed, tighten the wheel bearing adjustment nut to 17–25 ft lbs while rotating the wheel. This will seat the bearing. Loosen the adjusting nut ½ turn, then retighten it to 10–15 in. lbs.

Brake Drum Removal and Installation

See Steps 3 and 4 under "Drum Brakes Inspection."

Brake Shoe Removal and Installation

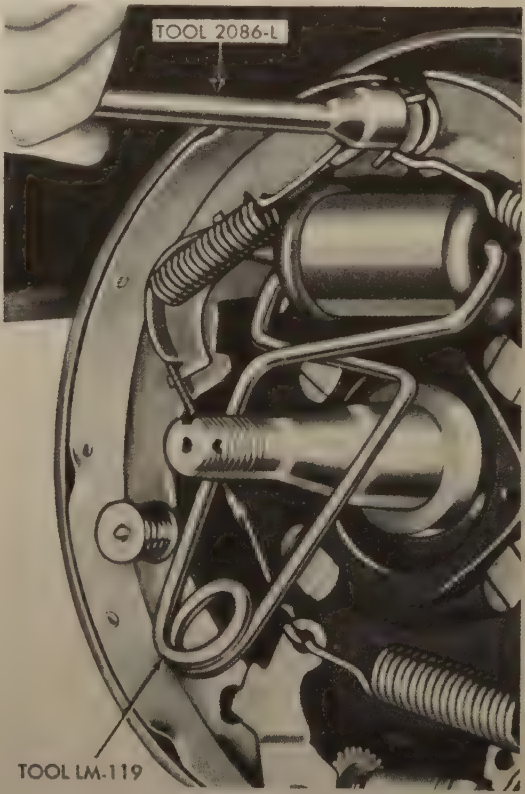
NOTE: *If you are not thoroughly familiar with the procedures involved in brake replacement, only disassemble and assemble one side at a time, leaving the other wheel intact as a reference.*

1. Remove the brake drum. See the inspection procedure.

2. Place the hollow end of a brake spring service tool (available at auto parts stores) on the brake shoe anchor pin and twist it to disengage one of the brake retracting springs. Repeat this operation to remove the other spring.

CAUTION: *Be careful the springs do not slip off the tool during removal, as they could cause personal injury.*

3. Reach behind the brake backing plate and place a finger on the end of one



Disengaging Retracting Spring

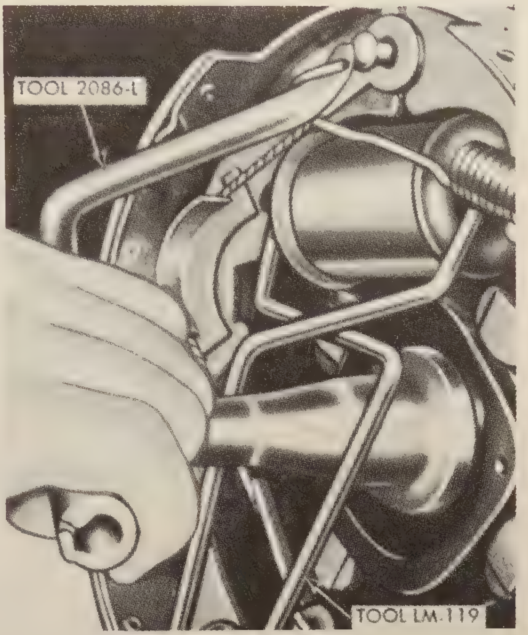
of the brake hold-down spring mounting pins. Using a pair of pliers, grasp the washer on the top of the hold-down spring that corresponds to the pin that you are holding. Push down on the pliers and turn them 90° to align the slot in the washer with the head on the spring mounting pin. Remove the spring and washer and repeat this operation on the hold-down spring on the other brake shoe.

4. Place the tip of a screwdriver on the top of the brake adjusting screw and move the screwdriver upward to lift up on the brake adjusting lever. When there is enough slack in the automatic adjuster cable, disconnect the loop on the top of the cable from the anchor. Grasp the top of each brake shoe and move it outward to disengage it from the wheel cylinder (and parking brake link on rear wheels). When the brake shoes are clear, lift them from the backing plate. Twist the shoes slightly and the automatic adjuster assembly will disassemble itself.

5. If you are working on rear brakes, grasp the end of the brake cable spring with a pair of pliers and, using the brake lever as a fulcrum, pull the end of the spring away from the lever. Disengage the cable from the brake lever.

6. The brake shoes are installed as follows: If you are working on the rear brakes, the brake cable must be connected to the secondary brake shoe before the shoe is installed on the backing plate. To do this, first transfer the parking brake lever from the old secondary shoe to the new one. This is accomplished by spreading the bottom of the horseshoe clip and disengaging the lever. Position the lever on the new secondary shoe and install the spring washer and the horseshoe clip. Close the bottom of the clip after installing it. Grasp the metal tip of the parking brake cable with a pair of pliers. Position a pair of side cutter pliers on the end of the cable coil spring and, using the pliers as a fulcrum, pull the coil spring back with the side cutters. Position the cable in the parking brake lever.

7. Apply a *light* coating of high-temperature grease to the brake shoe contact points on the backing plate. Position the primary brake shoe on the front of the backing plate and install the hold-down spring and washer over the mounting pin. Install the secondary shoe on the rear of the backing plate.



Installing Retracting (Return) Spring

8. If working on the rear brakes, install the parking brake link between the notch in the primary brake shoe and the notch in the parking brake lever.

9. Install the automatic adjuster cable loop end on the anchor pin. Make sure that the crimped side of the loop faces the backing plate.

10. Install the return spring in the primary brake shoe and, using the tapered end of a brake spring service tool, slide the top of the spring onto the anchor pin.

CAUTION: *Be careful to make sure that the spring does not slip off the tool during installation, as it could cause injury.*

11. Install the automatic adjuster cable guide in the secondary brake shoe, making sure that the flared hole in the cable guide is inside the hole in the brake shoe. Fit the cable into the groove in the top of the cable guide.

12. Install the secondary shoe return spring through the hole in the cable guide and the brake shoe. Using the brake spring tool, slide the top of the spring onto the anchor pin.

13. Clean the threads on the adjusting screw and apply a light coating of high-temperature grease to the threads. Screw the adjuster closed, then open it one-half turn.

14. Install the adjusting screw between the brake shoes with the starwheel nearest to the secondary shoe. Make sure that the starwheel is in a position that is accessible from the adjusting slot in the backing plate.

15. Install the short hooked end of the automatic adjuster spring in the proper hole in the primary brake shoe.

16. Connect the hooked end of the automatic adjuster cable and the free end of the automatic adjuster spring in the slot in the top of the automatic adjuster lever.

17. Pull the automatic adjuster lever (the lever will pull the cable and spring with it) downward and to the left and engage the pivot hook of the lever in the hole in the secondary brake shoe.

18. Check the entire brake assembly to make sure everything is installed properly. Make sure that the shoes engage the wheel cylinder properly and are flush on the anchor pin. Make sure that the automatic adjuster cable is flush on the anchor pin and in the slot on the back of the cable guide. Make sure that the adjusting lever rests on the adjusting screw starwheel. Pull upward on the adjusting cable until the adjusting lever is free of the starwheel, then release the cable. The adjusting lever should snap back into place on the adjusting screw starwheel and turn the wheel one tooth.

19. Expand the brake adjusting screw until the brake drum will just fit over the brake shoes.

20. Install the wheel and drum and adjust the brakes. See "Brake Adjustment."

Drum Brake Adjustment

NOTE: *Drum brakes installed in Mavericks and Comets are self-adjusting. All that is normally required to adjust the brakes is to apply them moderately hard several times while carefully backing the car in Reverse. However, if this action proves unsatisfactory, or if it proves necessary to re-adjust the brakes after replacing the linings or removing the drum, the following procedure may be used.*

1. Raise the car and support it with safety stands.

2. Remove the rubber plug from the adjusting slot on the backing plate.

3. Insert a brake adjusting spoon into the slot and engage the lowest possible tooth on the starwheel. Move the end of the brake spoon downward to move the starwheel upward and expand the adjusting screw. Repeat this operation until the brakes lock the wheel.

4. Insert a small screwdriver or piece of firm wire (coat-hanger wire) into the adjusting slot and push the automatic adjuster lever out and free of the starwheel on the adjusting screw.

5. Holding the adjusting lever out of the way, engage the topmost tooth possible on the starwheel with a brake adjusting spoon. Move the end of the adjusting spoon upward to move the adjusting screw starwheel downward and contract the adjusting screw. Back off the adjusting screw starwheel until the wheel spins freely with a minimum of drag. Keep track of the number of turns the starwheel is backed off.

6. Repeat this operation for the other side. When backing off the brakes on the other side, the adjusting lever must be backed off the same number of turns to prevent side-to-side brake pull.

7. Repeat this operation on the other set of brakes (front or rear).

8. When all 4 brakes are adjusted, make several stops, while backing the car, to equalize all of the wheels.

9. Road-test the car.

WHEEL CYLINDER

Removal and Installation

1. Remove the brake shoes.

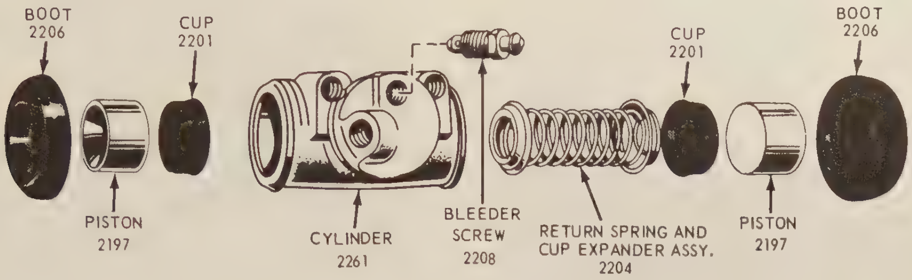
2. On rear brakes, loosen the brake line on the rear of the cylinder but do not pull the line away from the cylinder or it may bend.

3. On front brakes, disconnect the metal brake line from the rubber brake hose where they join in the wheel well. Pull off the horseshoe clip that attaches the rubber brake hose to the underbody of the car. Loosen the hose at the cylinder, then turn the whole brake hose to remove it from the wheel cylinder.

4. Remove the bolts and lockwashers that attach the wheel cylinder to the backing plate and remove the cylinder.

5. Position the new wheel cylinder on the backing plate and install the cylinder attaching bolts and lockwashers.

6. Attach the metal brake line or rub-



Drum Brake Wheel Cylinder Disassembled

ber hose by reversing the procedure given in Steps 2 or 3.

7. Install the brakes.

Overhaul

Since the travel of the pistons in the wheel cylinder changes when new brake shoes are installed, it is possible for previously good wheel cylinders to start leaking after new brakes are installed. Therefore, to save yourself the expense of having to replace new brakes that become saturated with brake fluid and the aggravation of having to take everything apart again, it is strongly recommended that wheel cylinders be rebuilt every time new brake shoes are installed. This is especially true on high-mileage cars.

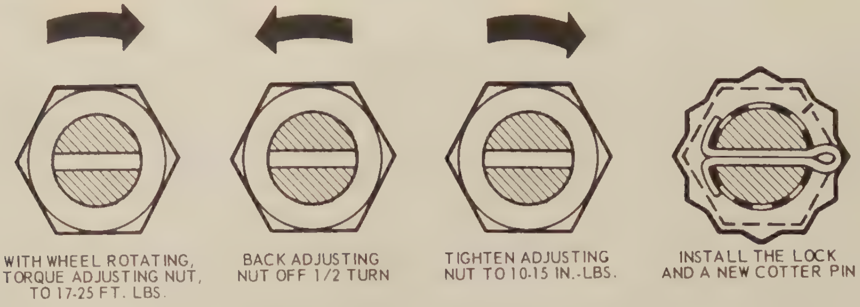
1. Remove the brakes.
2. Place a bucket or old newspapers under the brake backing plate to catch the brake fluid that will run out of the wheel cylinder.
3. Remove the boots from the ends of the wheel cylinders.
4. Push one piston toward the center of the cylinder to force the opposite piston and cup out the other end of the cylinder. Reach in the open end of the cylinder and push the spring, cup, and piston out of the cylinder.
5. Remove the bleeder screw from the rear of the cylinder, on the back of the backing plate.
6. Inspect the inside of the wheel cylinder. If it is scored in any way, the cylinder must be honed with a wheel cylinder hone or fine emery paper, and finished with crocus cloth if emery paper is used. If the inside of the cylinder is excessively worn, the cylinder will have to be replaced, as only 0.003 in. of material can be removed from the cylinder walls. When honing or cleaning the wheel cylinders, keep a small amount of brake fluid in the cylinder to serve as a lubricant.
7. Clean any foreign matter from the pistons. The sides of the pistons must be smooth for the wheel cylinders to operate properly.
8. Clean the cylinder bore with alcohol and a lint-free rag. Pull the rag through the bore several times to remove all foreign matter and dry the cylinder.
9. Install the bleeder screw and the return spring in the cylinder.
10. Coat new cylinder cups with new brake fluid and install them in the cylinder. Make sure that they are square in the bore or they will leak.
11. Install the pistons in the cylinder after coating them with new brake fluid.
12. Coat the insides of the boots with new brake fluid and install them on the cylinder. Install the brakes.

FRONT WHEEL BEARINGS

Adjustment

The front wheels each rotate on a set of opposed, tapered roller bearings as shown in the accompanying illustration. The grease retainer at the inside of the hub prevents lubricant from leaking into the brake drum.

Adjustment of the wheel bearings is accomplished as follows: Lift the car so that the wheel and tire are clear of the ground, then remove the grease cap and remove excess grease from the end of the spindle. Remove the cotter pin and nut lock shown in the illustration. Rotate the wheel, hub and drum assembly while tightening the adjusting nut to 17–25 ft. lbs. in order to seat the bearings. Back off the adjusting nut one half turn, then retighten the ad-


WITH WHEEL ROTATING, TORQUE ADJUSTING NUT, TO 17-25 FT. LBS.
BACK ADJUSTING NUT OFF 1/2 TURN
TIGHTEN ADJUSTING NUT TO 10-15 IN.-LBS.
INSTALL THE LOCK AND A NEW COTTER PIN

Front Wheel Bearing Adjustment

justing nut to 10–15 in. lbs. (*inch-pounds*). Locate the nut lock on the adjusting nut so that the castellations on the lock are lined up with the cotter pin hole in the spindle. Install a new cotter pin, bending the ends of the cotter pin around the castellated flange of the nut lock. Check the front wheel for proper rotation, then install the grease cap. If the wheel still does not rotate properly, inspect and clean or replace the wheel bearings and cups.

Removal, Repacking and Installation

Drum Brakes

The procedure for cleaning, repacking and adjusting front wheel bearings on vehicles equipped with self-adjusting drum brakes is as follows:

1. Taking proper safety precautions, raise the car until the wheel and tire clear the floor. Install jack stands under the lower control arms.

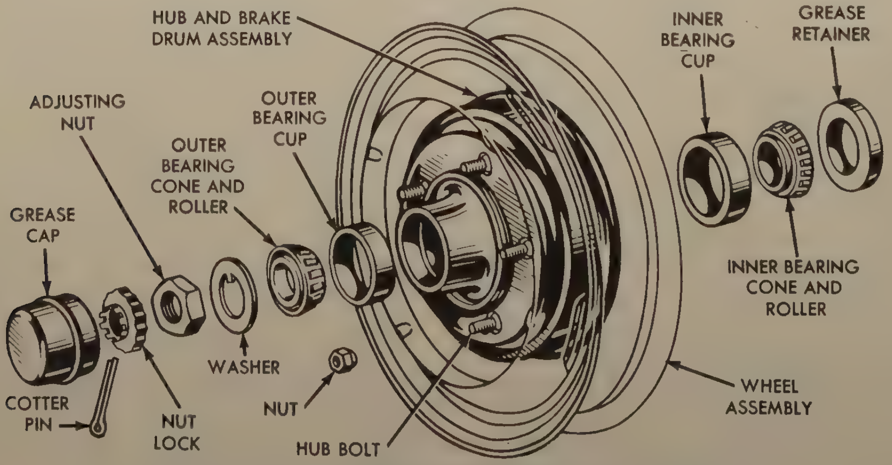
2. Remove the wheel cover. Remove the grease cap from the hub. Then remove the cotter pin, nut lock, adjusting nut, and flat washer from the spindle. Remove the outer bearing cone and roller assembly.

3. Pull the wheel, hub and drum assembly off the spindle. When encountering a brake drum that will not come off, disengage the adjusting lever from the adjusting screw by inserting a narrow screwdriver through the adjusting hole in the carrier plate. While the lever is disengaged, back off the adjusting screw with a brake adjusting tool. The self-adjusting mechanism will not function properly if the adjusting screw is burred, chipped, or otherwise damaged in the process, so exercise extreme care.

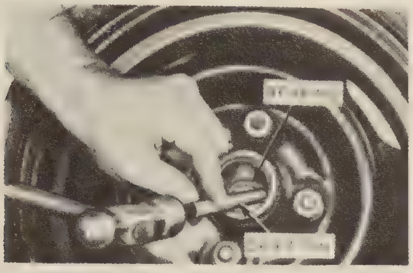
4. Remove the grease retainer and the inner bearing cone and roller assembly from the hub.

5. Clean all grease off from the inner and outer bearing cups with solvent. Inspect the cups for pits, scratches, or excessive wear. If the cups are damaged, remove them with a drift.

6. Clean the inner and outer cone and


HUB AND BRAKE DRUM ASSEMBLY
INNER BEARING CUP
GREASE RETAINER
ADJUSTING NUT
OUTER BEARING CUP
OUTER BEARING CONE AND ROLLER
GREASE CAP
INNER BEARING CONE AND ROLLER
WASHER
NUT
WHEEL ASSEMBLY
COTTER PIN
NUT LOCK
HUB BOLT

Front Hub, Bearing and Grease Retainer—Drum Brakes



Removing Grease Retainer

roller assemblies with solvent and shake them dry. If the cone and roller assemblies show excessive wear or damage, replace them with the bearing cups as a unit.

7. If the new grease retainer is of leather, soak it in light engine oil for 30 minutes, prior to installation. Wipe any excess from the metal portion of the retainer. Clean the spindle and the inside of the hub with solvent to thoroughly remove all old grease.

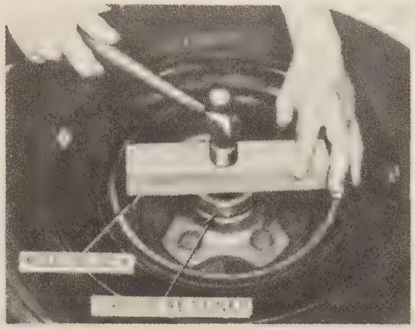
Brushing Dirt from Drum Brake Assembly

8. Covering the spindle with a clean cloth, brush all loose dirt and dust from the brake assembly. Remove the cloth carefully so as to not get dirt on the spindle.

9. If the inner and/or outer bearing cups were removed, install the replacement cups on the hub. Be sure that the cups seat properly in the hub.

10. It is imperative that all old grease be removed from the bearings and surrounding surfaces before repacking. The new lithium-base grease is not compatible with the sodium base grease used in the past.

11. Pack the inside of the hub with wheel bearing grease. Add grease to the hub until it is flush with the inside diameter of both bearing cups. Work as much grease as possible between the rollers and cages in the cone and roller assemblies. Lubricate the cone surfaces with grease.



Installing Grease Retainer

12. Position the inner bearing cone and roller assembly in the inner cup. If a leather grease retainer has soaked for 30 minutes, wipe all excess from the metal portion of the retainer and install. Other grease retainers require a light film of grease on the lips before installation. Using a wooden block to evenly distribute the blow of a hammer, install the retainer. Make sure that the retainer is properly seated.

13. Install the wheel, hub, and drum assembly on the wheel spindle. To prevent damage to the grease retainer and spindle threads, keep the hub centered on the spindle.

14. Install the outer bearing cone and roller assembly and the flat washer on the spindle. Install the adjusting nut.

15. Adjust the wheel bearings by tightening the adjusting nut to 17–25 ft lbs with the wheel rotating to seat the bearing. Then back off the adjusting nut ½ turn. Retighten the adjusting nut to 10–15 in. lbs. Install the locknut so that the castellations are aligned with the cotter pin hole. Install the cotter pin. Bend the ends of the cotter pin around the castellations of the locknut to prevent interference with the radio static collector in the grease cap. Install the grease cap.

16. Remove the adjusting hole cover from the carrier plate and, from the carrier plate side, turn the adjusting screw starwheel upward with a brake adjusting tool. Expand the brake shoes until a slight drag is felt with the drum rotating. Replace the adjusting hole cover.

17. Install the wheel cover.

DISC BRAKES

1. Raise the front of the car and support it with safety stands.

2. Remove the front wheels.

NOTE: *In order to remove the rotor, the caliper and anchor plate must be removed from the car.*

3. Loosen, but do not remove, the upper anchor plate attaching bolt with a ¾ in. socket.

4. Using a ⅝ in. socket, remove the lower anchor plate attaching bolt.

NOTE: *When the caliper is removed from the car it must be wired out of the way of the rotor. Also, the brake pads will fall out of the caliper if they are not held in place when the caliper is removed. You will have to insert a small piece of wood or a folded piece of heavy cardboard between the shoes to hold them in place. Have a piece of wire and a piece of wood handy before you start the next step.*

5. Hold the caliper in place and remove the upper anchor plate attaching bolt.

6. Slide the caliper and anchor plate assembly off the rotor, inserting the block of wood between the brake pads as they become visible above the rotor.

7. When the anchor plate is clear of the rotor, wire it out of the way.

8. Remove the dust cap from the rotor hub by either prying it off with a screwdriver or pulling it off with a pair of channel-lock pliers.

9. Remove the cotter pin and the nut lock from the spindle.

10. Loosen the bearing adjusting nut until it is at the end of the spindle.

11. Grasp the rotor with a rag and pull it outward, push it inward.

12. Remove the adjusting nut and the outer bearing.

13. Remove the rotor from the spindle.

14. Place the rotor and tire on a clean, paper-covered surface with the wheel studs facing upward.

15. Working through the hole in the center of the wheel hub, tap the grease seal out of the rear of the hub with a screwdriver or drift.

NOTE: *Be careful not to damage the inner bearing while knocking out the grease seal.*

16. Remove the grease seal and bearing from under the rotor, and discard the grease seal.

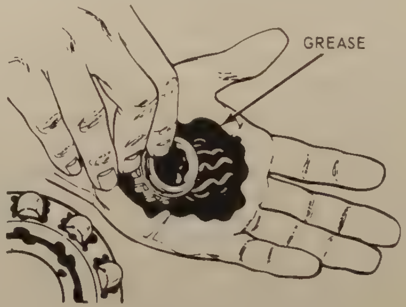
17. Clean the inner and outer bearings and the wheel hub with a suitable solvent. Remove all old grease.

18. Thoroughly dry and wipe clean all components.

19. Clean all old grease from the spindle on the car.

20. Carefully check the bearings for any sign of scoring or other damage. If the roller bearings or bearing cages are damaged, the bearing and the corresponding bearing cup in the rotor hub must be replaced. The bearing cups must be driven out of the rotor hub to be removed. The outer bearing cup is driven out of the front of the rotor from the rear and vice versa for the inner bearing cup.

21. Whether you are reinstalling the old bearings or installing new ones, the bearings must be packed with wheel bearing grease. To do this, place a glob of grease in your left palm, then, holding one of the bearings in your right hand, drag the edge of the bearing heavily through the grease. This must be done to work as much grease as possible through the roller bearings and cage. Turn the bearing and continue to pull it through the grease until the grease is packed between the bearings and the cage all the way around the circumference of the bearing. Repeat this operation until all of the bearings are packed with grease.



22. Pack the inside of the rotor hub with a moderate amount of grease, between the bearing cups. Do not overload the hub with grease.

23. Apply a small amount of grease to the spindle.

24. Place the rotor, face down, on a protected surface and install the inner bearing.

25. Coat the lip of a new grease seal with a small amount of grease and position it on the rotor.

26. Place a block of wood on top of the grease seal and tap on the block with a hammer to install the seal. Turn the block of wood to different positions to seat it squarely in the hub.

27. Position the rotor on the spindle.

28. Install the outer bearing and washer on the spindle, inside the rotor hub.

29. Install the bearing adjusting nut and tighten it to 17–25 ft lbs while spinning the rotor. This will seat the bearing.

30. Back off the adjusting nut one half turn.

31. Tighten the adjusting nut to 10–15 in. lbs.

32. Install the nut lock on the adjusting nut so two of the slots align with the hole in the spindle.

33. Install a new cotter pin and bend the ends back so they will not interfere with the dust cap.

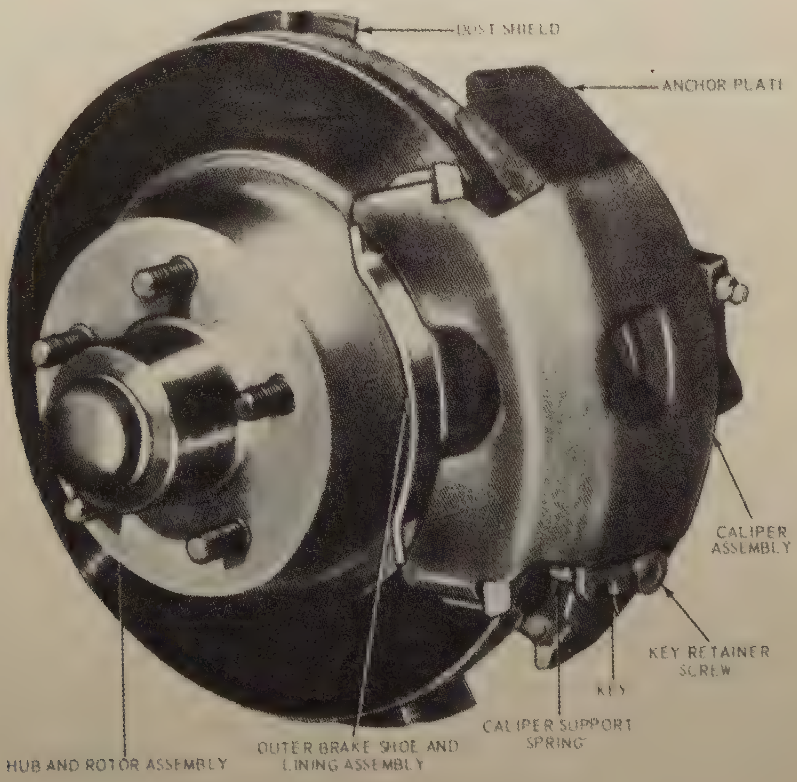
34. Install the dust cap.

35. Install the front tires if they were removed.

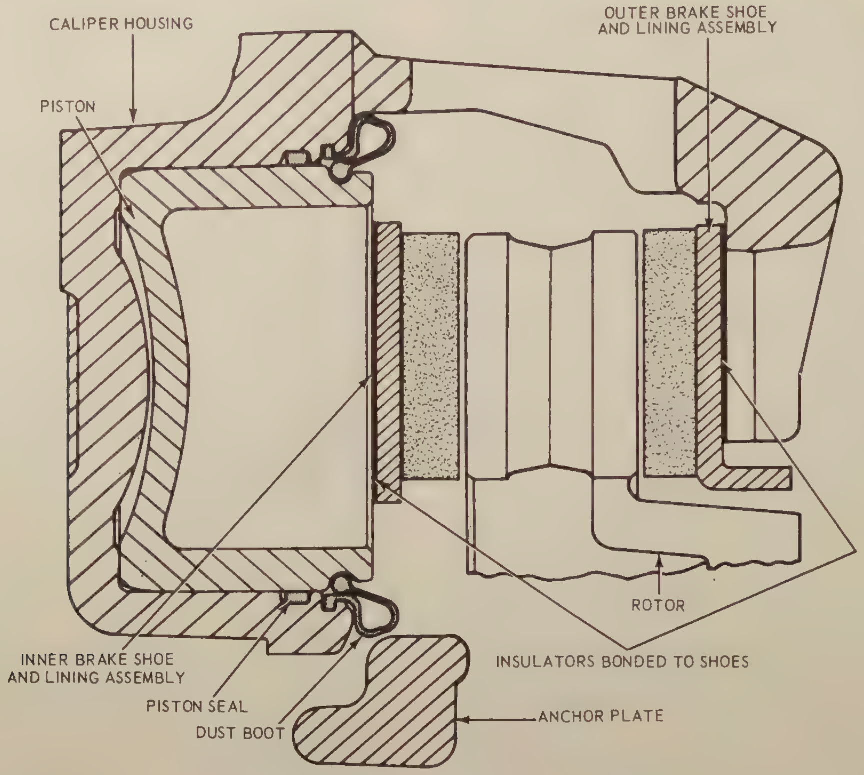
Disc Brakes

Instead of the traditional expanding brakes that press outward against a circular drum, disc brake systems utilize a cast iron disc with brake pads (linings or shoes). Braking effect is achieved in a manner similar to the way that you would squeeze a spinning phonograph record between your fingers. The disc (rotor) is a one-piece casting with cooling fins between the two braking surfaces. This enables air to circulate between the braking surfaces, making them less sensitive to heat buildup and more resistant to fade. Dirt and water do not affect braking action since such contaminants are thrown off by the centrifugal action of the rotor or scraped off by the pads. Also, the equal clamping action of the brake pads tends to ensure uniform, straight-line stops. All disc brakes are inherently self-adjusting.

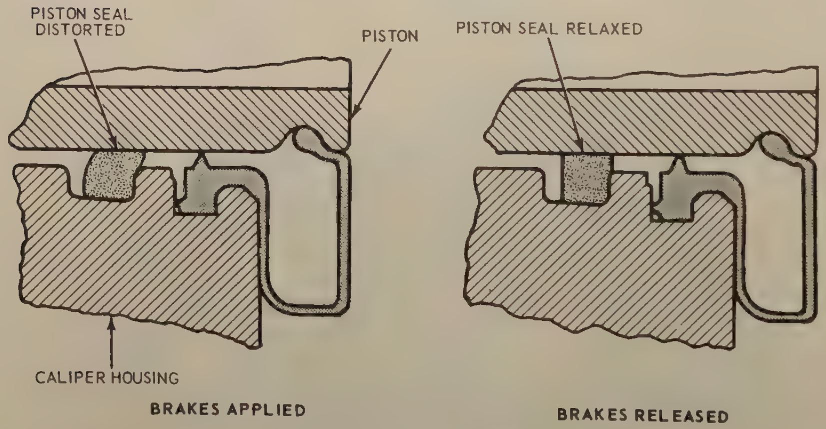
Sliding caliper disc brakes are used at the front of many 1974 and later models. The name of this system is derived from the sliding action of the brake caliper on the anchor plate during braking. The plate-like brake rotor is attached to and mounted on the car by the front wheel hub. A brake caliper anchor plate, attached to the front wheel spindle, mounts over the top of, but does not touch, the rotor. The caliper is mounted in the middle of the large opening in the



Sliding Caliper Disc Brake Assembly


CALIPER HOUSING
OUTER BRAKE SHOE AND LINING ASSEMBLY
PISTON
ROTOR
INNER BRAKE SHOE AND LINING ASSEMBLY
INSULATORS BONDED TO SHOES
PISTON SEAL
DUST BOOT
ANCHOR PLATE

Sectional View of Sliding Caliper Assembly


PISTON SEAL DISTORTED
PISTON
PISTON SEAL RELAXED
CALIPER HOUSING
BRAKES APPLIED
BRAKES RELEASED

Function of Piston Seal

anchor plate. When the brake pedal is depressed, and hydraulic force is generated, the piston in the caliper forces the inboard brake pad inward and into contact with the brake rotor. The caliper now begins to act like a C-clamp, with the inboard shoe and the piston acting as the adjustable screw. Since there is only a small amount of clearance between the brake pads and the rotor, the inboard shoe contacts the rotor almost as soon as the brake pedal is depressed. As the brake pedal is depressed further, it increases the amount of hydraulic pressure sent to the piston in the caliper. Since the inboard shoe is already in contact with the brake rotor, it cannot be moved. As the caliper pushes on the inboard brake shoe, the increased hydraulic pressure forces the back of the caliper housing away from the back of the piston. This causes the caliper to slide inward on the anchor plate and force the outboard brake pad into contact with the rotor. Thus the name sliding caliper. This happens very quickly, so both pads contact the rotor at about the same time.

Disc Pad Removal and Installation

1. Remove approximately ⅔ of the fluid from the rear reservoir of the tandem master cylinder. Raise the vehicle, taking proper safety precautions. Install jack stands beneath the lower control arms.

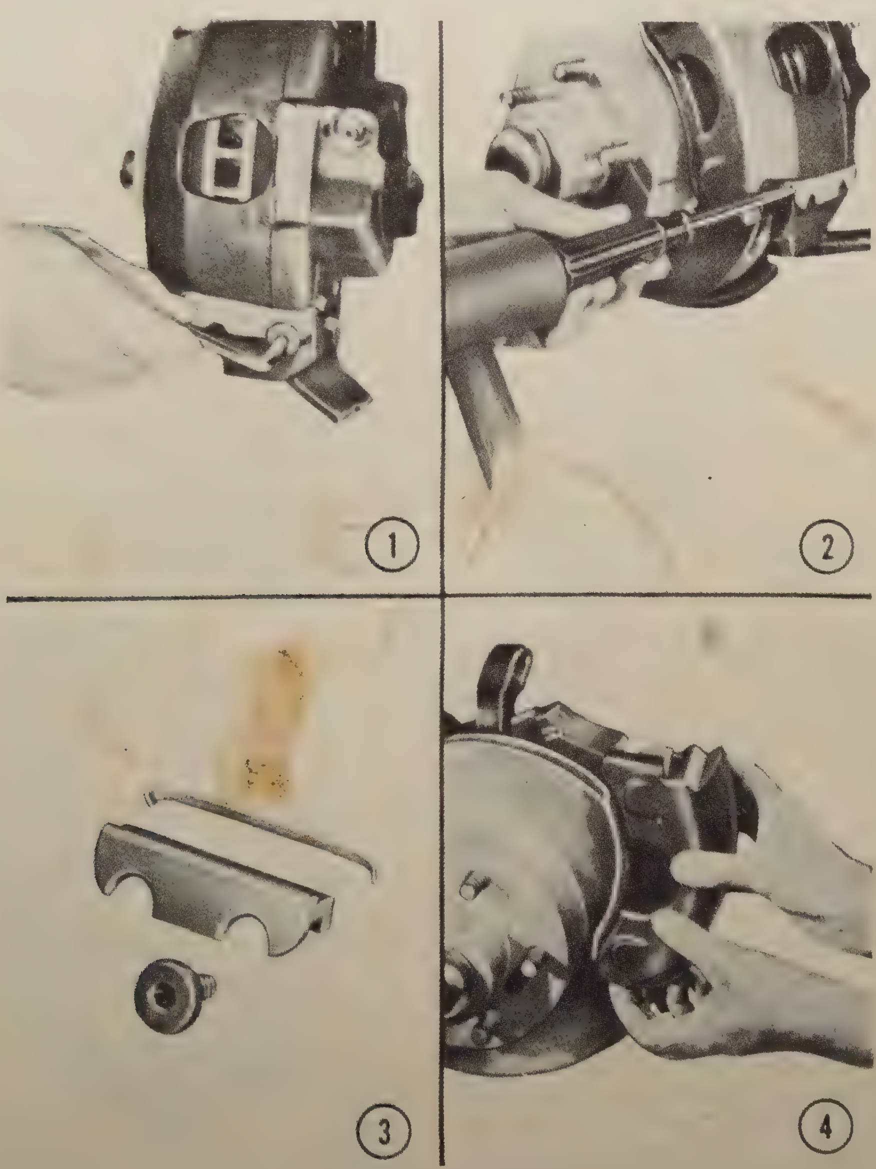
2. Remove the wheel and tire assembly.

3. Remove the key retaining screw from the caliper retaining key.

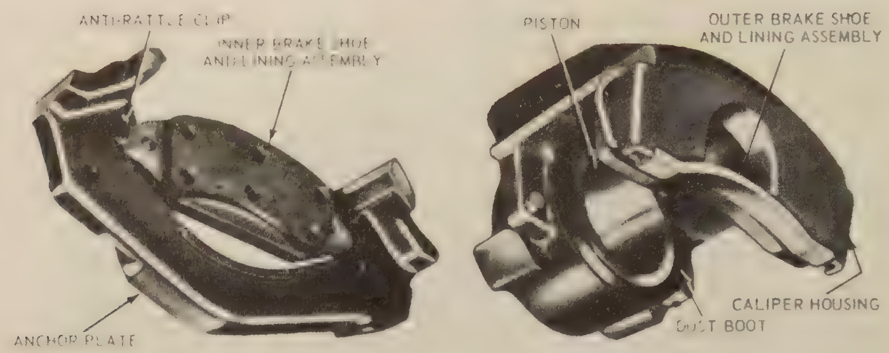
4. Slide the retaining key and support spring either inward or outward from the anchor plate. To remove the key and spring, a hammer and drift may be used, taking care not to damage the key in the process.

5. Lift the caliper assembly away from the anchor plate by pushing the caliper downward against the anchor plate and rotating the upper end upward out of the anchor plate. Be careful not to stretch or twist the flexible brake hose. Safety wire the caliper to the suspension arm.

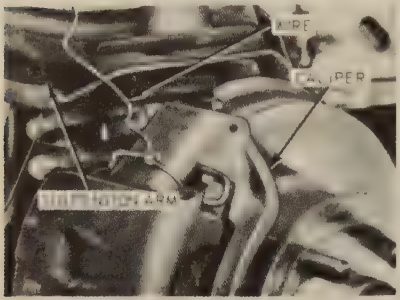
6. Remove the inner shoe and lining assembly from the anchor plate. The inner



Removing Caliper Assembly


ANTI-RATTLE CLIP
INNER BRAKE SHOE AND LINING ASSEMBLY
ANCHOR PLATE
PISTON
OUTER BRAKE SHOE AND LINING ASSEMBLY
CALIPER HOUSING
DUST BOOT

Caliper and Outer Shoe Removed from Anchor Plate



Wiring Caliper to Suspension Arm

shoe antirattle clip may become displaced at this time and should be repositioned on the anchor plate. Lightly tap on the outer shoe and lining assembly to free it from the caliper.

7. Clean the caliper, anchor plate, and disc assemblies, and inspect them for brake fluid leakage, excessive wear or signs of damage. Replace the pads if either of them are worn to within 1/32 in. of the rivet heads.

8. To install new pads, use a 4 in. C-clamp and a block of wood 1¾ in. × 1 in. and approximately ¾ in. thick to seat the caliper hydraulic piston in its bore. This must be done in order to provide clearance for the caliper to fit over the rotor when new linings are installed.

9. At this point, the antirattle clip should be in its place on the lower inner brake shoe support of the anchor plate with the pigtail of the clip toward the inside of the anchor plate. Position the inner brake shoe and lining assembly on the anchor plate with the pad toward the disc.

10. Install the outer brake shoe with the lower flange ends against the caliper leg abutments and the brake shoe upper flanges over the shoulders on the caliper legs. The shoe is installed correctly when its flanges fit snugly against the machined surfaces of the shoulders.

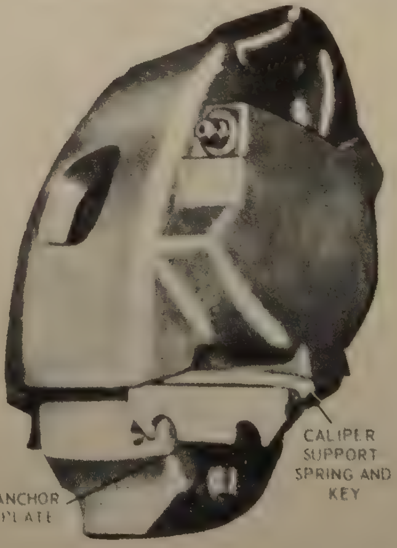
11. Remove the C-clamp used to seat the caliper piston in its bore. The piston will remain seated.

12. Position the caliper housing lower V-groove on the anchor plate lower abutment surface.

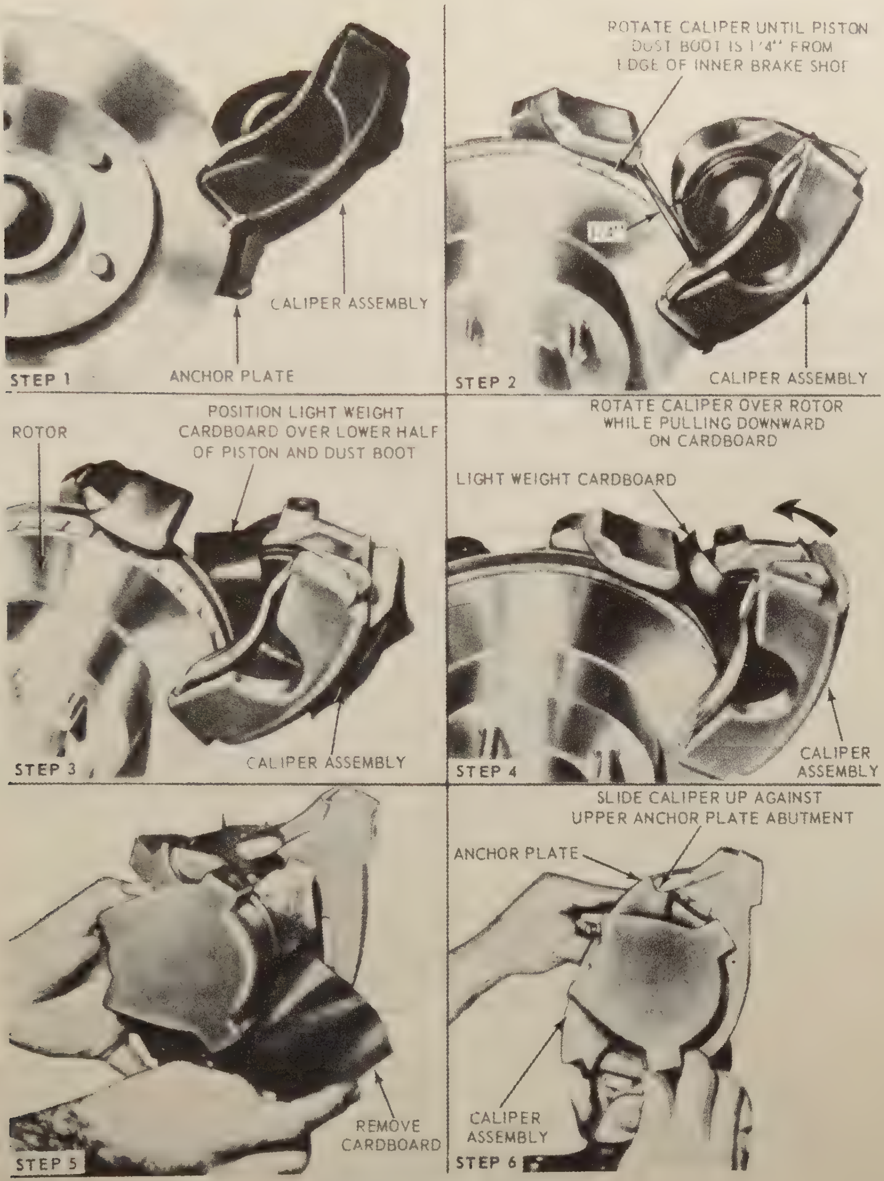
13. Pivot the caliper housing upward toward the disc until the outer edge of the piston dust boot is about ¼ in. from the upper edge of the inboard pad.

14. In order to prevent pinching of the dust boot between the piston and the inboard pad during installation of the caliper, place a clean piece of thin cardboard between the inboard pad and the lower half of the piston dust boot.

15. Rotate the caliper housing toward the disc until a slight resistance is felt. At this point, pull the cardboard downward toward the disc centerline while rotating



Installing Caliper Support Spring and Retaining Key


CALIPER ASSEMBLY
ANCHOR PLATE
STEP 1
ROTATE CALIPER UNTIL PISTON DUST BOOT IS 1/4" FROM EDGE OF INNER BRAKE SHOE
STEP 2
CALIPER ASSEMBLY
ROTOR
POSITION LIGHT WEIGHT CARDBOARD OVER LOWER HALF OF PISTON AND DUST BOOT
STEP 3
CALIPER ASSEMBLY
ROTATE CALIPER OVER ROTOR WHILE PULLING DOWNWARD ON CARDBOARD
LIGHT WEIGHT CARDBOARD
STEP 4
CALIPER ASSEMBLY
STEP 5
REMOVE CARDBOARD
SLIDE CALIPER UP AGAINST UPPER ANCHOR PLATE ABUTMENT
ANCHOR PLATE
CALIPER ASSEMBLY
STEP 6

Installing Caliper Assembly

the caliper over the disc. Then remove the cardboard and complete the rotation of the caliper down over the disc.

16. Slide the caliper up against the upper abutment surfaces of the anchor plate and center the caliper over the lower anchor plate abutment.

17. Position the caliper support spring and key in the key slot and slide them into the opening between the lower end of the caliper and the lower anchor plate abutment until the key semicircular slot is centered over the retaining screw threaded hole in the anchor plate.

18. Install the key retaining screw and torque to 12–16 ft lbs.

19. Check the fluid level in the master cylinder and fill as necessary. Install the reservoir cover. Depress the brake pedal several times to properly seat the caliper and pads. Check for leakage around the caliper and flexible brake hose.

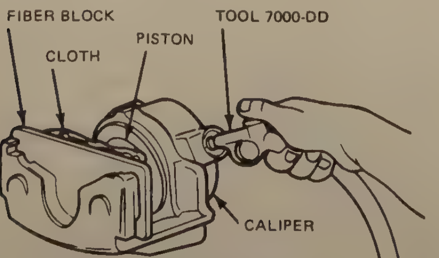
20. Install the wheel and tire assembly and torque the nuts to 70–115 ft lbs. Install the wheel cover.

21. Lower the car. Make sure that you obtain a firm brake pedal and then road-test the car for proper brake operation.

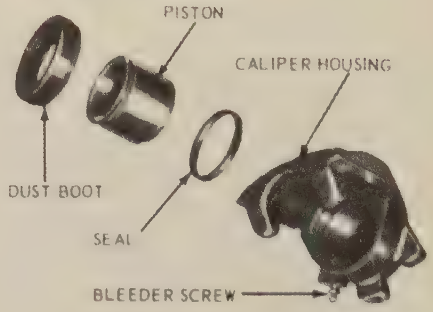
Disc Caliper Removal, Overhaul and Installation

1. Raise the vehicle and place jackstands underneath the lower control arms.
2. Remove the wheel and tire assembly.
3. Disconnect the flexible brake hose from the caliper. To disconnect the hose, loosen the tube fitting which connects the end of the hose to the brake tube at its bracket on the frame. Remove the horseshoe clip from the hose and bracket, disengage the hose, and plug the end. Then unscrew the entire hose assembly from the caliper.
4. Remove the key retaining screw from the caliper retaining key.
5. Slide the retaining key and support spring either inward or outward from the anchor plate. To remove the key and spring, a hammer and drift may be used, taking care not to damage the key in the process.
6. Lift the caliper assembly away from the anchor plate by pushing the caliper downward against the anchor plate and rotating the upper end upward out of the anchor plate.
7. Remove the piston by applying compressed air to the fluid inlet port with a rubber-tipped nozzle. Place a towel or thick cloth over the piston before applying air pressure to prevent damage to the piston. If the piston is seized in the bore and cannot be forced from the caliper, lightly tap around the outside of the caliper while applying air pressure.

   CAUTION: *Do not attempt to catch the piston with your hand.*
8. Remove the dust boot from the caliper assembly.
9. Remove the piston seal from the cylinder and discard it.
10. Clean all metal parts with isopropyl alcohol or a suitable non-petroleum solvent and dry them with compressed air. Be sure there is no foreign material in the bore or component parts. Inspect the piston and bore for excessive wear or damage. Replace the piston if it is pitted, scored, or if the chrome plating is wearing off.
11. Lubricate all new rubber parts in brake fluid. Install the piston seal in the cylinder groove, being careful not to twist it. Install the dust boot by setting the flange squarely in the outer groove of the bore.
12. Coat the piston with brake fluid and install it in the bore. Work the dust boot around the outside of the piston, making sure that the boot lip is seated in the piston groove.
13. Install the caliper as outlined in Steps 12–18 in the sliding caliper "Disc Pad Removal and Installation" procedure.
14. Thread the flexible brake hose and gasket onto the caliper fitting. Torque the fitting to 12–20 ft lbs. Place the upper end of the flexible brake hose in its bracket and install the horseshoe clip. Remove the plug from the brake tube and connect the tube to the hose. Torque the tube fitting nut to 10–15 ft lbs.
15. Bleed the brake system as outlined in the "Brake Bleeding" section.
16. Check the fluid level in the master cylinder and fill as necessary. Install the reservoir cover. Depress the brake pedal several times to properly seat the caliper and shoes. Check for leakage around the caliper and the flexible brake hose.
17. Install the wheel and tire assembly and torque the nuts to 70–115 ft lbs. Install the wheel cover.
18. Lower the car. Make sure that you obtain a firm brake pedal and then road-test the car for proper brake operation.



Removing Piston from Caliper

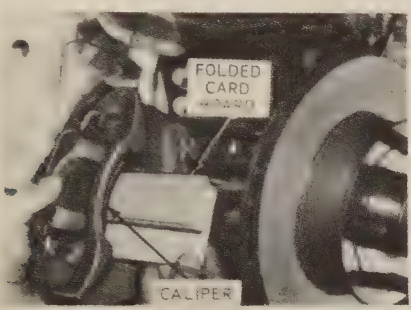


Caliper Disassembled

HUB AND DISC ASSEMBLY

Removal and Installation

1. Raise the front of the vehicle and install jack stands beneath the lower control arms.
2. Remove the wheel and tire assembly.
3. Remove the caliper from its mount as described under Steps 3–6 of "Disc Caliper Removal, Overhaul and Installation." Wire the caliper out of the way to the upper control arm, taking care not to twist or damage the flexible brake hose. Do not remove the anchor plate. Insert folded cardboard or wood between the brake pads to keep the piston seated.



Inserting Cardboard or Wood Between Brake Pads

4. Remove the grease cap from the hub. Remove the cotter pin, nut lock, and adjusting nut from the spindle.
5. Remove the outer wheel bearing and flat washer from the hub by first pulling the hub and disc assembly out far enough to loosen the bearing, then pushing it back in and removing the bearing and washer. Slide the hub and disc assembly off the spindle.

   NOTE: *If a new disc is being installed, remove the protective coating with carburetor degreaser, and pack a new set of wheel bearings with wheel bearing grease. If the original disc is being installed, make sure that the grease in the hub is clean and adequate. Also make sure that the inner bearing and grease retainer and lubricated and in good condition, and that the disc braking surfaces are clean.*
6. Slide the hub and disc assembly onto the spindle. Install the outer wheel bearing and flat washer and adjusting nut on the spindle. Tighten the adjusting nut finger-tight, so that the hub and rotor may spin freely.

   Inspect the disc (rotor) for scoring or corrosion. Minor scores or rust spots may be removed with a fine emery cloth. If the braking area is excessively scored or rusted, the disc must be replaced. Check the disc for warpage (run-out). Tighten the wheel bearing adjusting nut so that the end-play is taken up. Make sure that the disc can still be rotated. Then, hand-spin the disc and check for wobbling or an out-of-round condition. Minor run-out may be corrected by machining. Maximum allowable run-out is 0.003 in. Re-adjust the wheel bearing to specifications.
7. Install the caliper to its mount as described under Steps 12–18 of "Disc Pad Removal and Installation".
8. Install the wheel and tire assembly.
9. Adjust the wheel bearing as outlined under "Wheel Bearing Adjustment".
10. Remove the jack stands, lower the car, and tighten the wheel lug nuts to 70–115 ft lbs.
11. Apply the brakes several times to properly position the brake pads. Road test the car for proper brake operation.

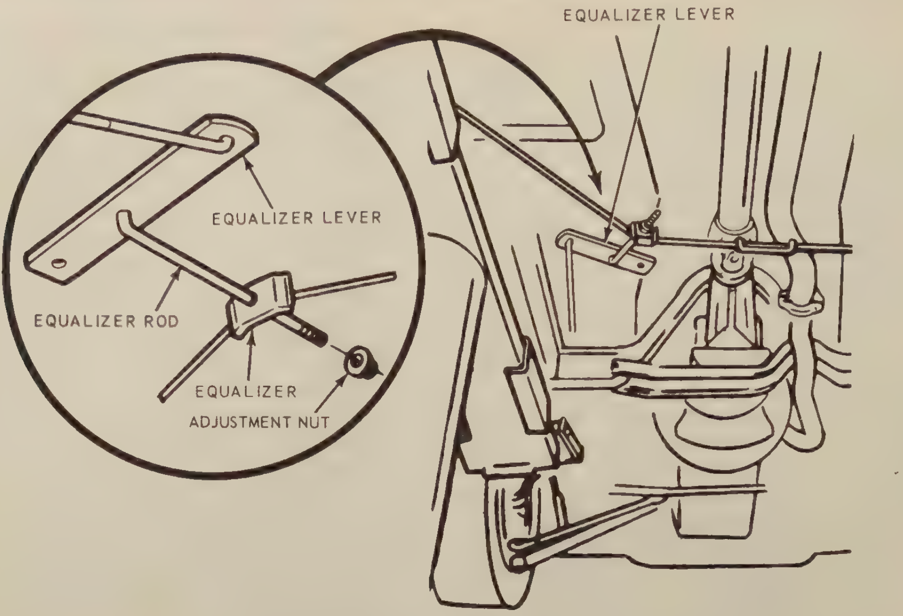
Parking Brake

Adjustment

1. Make sure that the parking brake is fully released.
2. Place the transmission in Neutral. If it is necessary to raise the car to obtain access to the cable adjusting point, raise the car on an axle-type hoist so as not to off-load the suspension and stretch the brake cables.
3. Tighten the adjusting nut against the cable equalizer until a drag is felt when a rear wheel is turned by hand. Then, loosen the adjusting nut until the rear brakes are fully released. There must be no brake drag, or premature lining wear and possible brake fade from heat buildup may result. Tighten the locknut, if so equipped, to 7–10 ft lbs.
4. If the vehicle was raised, lower it and test the operation of the brake on a grade.

Removal and Installation

1. Remove the hairpin clip and clevis pin securing the cable pulley to the con-



Parking Brake Linkage Adjustment

trol handle assembly and remove the pulley.

2. Disengage the locking pawl and slide the control rod forward. Remove the cable ball from the slot in the control rod.

3. Remove the hairpin retainer from the dash panel bracket and disengage the cable from its bracket.

4. Pull the cable and insulator tube down through the hole in the dash panel. Remove the insulator tube from the cable.

5. Raise the car on a hoist. If a hoist is not available, a floor jack may be used, but jack stands must be placed beneath the lower control arms and rear axle housing.

6. Remove the retaining screw and clip from the cable on the chassis side rail.

7. Disengage the cable stepped rod from the equalizer lever.

Brake Specifications

(All measurements are given in in.)

		Master Cylinder Bore		*Wheel Cylinder Bore*			*Brake Disc or Drum Diameter*		
				Front		*Rear*	*Front*		*Rear*
Year	*Model*	*Disc*	*Drum*	*Disc*	*Drum*		*Disc*	*Drum*	
1970–72	6 Cyl	—	1.0	—	1.062	0.844	—	9.0	9.0
	8 Cyl	—	1.0	—	1.125	0.875	—	10.0	10.0 ①
1973	All	—	1.0	—	1.125	0.875	—	10.0	10.0
1974–75	All	0.938	0.938	2.6	1.125	0.875	11.03	10.0	10.0
1976	All	0.938	—	2.6	—	0.938	11.03	—	10.0

① 10 in. brakes required on all 250 six-cylinder cars equipped with D70-14 or DR78-14 tires.

8. Remove the hairpin retainer from the cable housing at the crossmember.

9. Pull the cable forward through the crossmember and remove it from the car.

10. To install, pass the stepped rod rearward through the crossmember and connect it into the equalizer lever.

11. Install the hairpin retainer on the cable housing at the crossmember.

12. Install the cable housing retainer clip on the cable and install the retainer screw on the chassis side rail.

13. Install the insulator tube onto the upper end of the cable, and push the cable and insulator up through the hole in the dash panel.

14. Engage the upper end of the cable housing in the dash panel bracket, and install the hairpin retainer.

15. Connect the cable ball to the control rod.

16. Assemble the pulley to the control assembly and install the clevis pin and hairpin retainer.

17. Lower the car. Check the operation of the parking brake. Adjust as necessary as outlined under "Parking Brake Adjustment".

Appendix

General Conversion Table

Multiply by	*To convert*	*To*	
2.54	Inches	Centimeters	.3937
30.48	Feet	Centimeters	.0328
.914	Yards	Meters	1.094
1.609	Miles	Kilometers	.621
.645	Square inches	Square cm.	.155
.836	Square yards	Square meters	1.196
16.39	Cubic inches	Cubic cm.	.061
28.3	Cubic feet	Liters	.0353
.4536	Pounds	Kilograms	2.2045
4.546	Gallons	Liters	.22
.068	Lbs./sq. in. (psi)	Atmospheres	14.7
.138	Foot pounds	Kg. m.	7.23
1.014	H.P. (DIN)	H.P. (SAE)	.9861
——	To obtain	From	Multiply by

Note: 1 cm. equals 10 mm.; 1 mm. equals .0394″.

Conversion—Common Fractions to Decimals and Millimeters

Inches			Inches			Inches		
Common Fractions	*Decimal Fractions*	*Millimeters (approx.)*	*Common Fractions*	*Decimal Fractions*	*Millimeters (approx.)*	*Common Fractions*	*Decimal Fractions*	*Millimeters (approx.)*
1/128	.008	0.20	11/32	.344	8.73	43/64	.672	17.07
1/64	.016	0.40	23/64	.359	9.13	11/16	.688	17.46
1/32	.031	0.79	3/8	.375	9.53	45/64	.703	17.86
3/64	.047	1.19	25/64	.391	9.92	23/32	.719	18.26
1/16	.063	1.59	13/32	.406	10.32	47/64	.734	18.65
5/64	.078	1.98	27/64	.422	10.72	3/4	.750	19.05
3/32	.094	2.38	7/16	.438	11.11	49/64	.766	19.45
7/64	.109	2.78	29/64	.453	11.51	25/32	.781	19.84
1/8	.125	3.18	15/32	.469	11.91	51/64	.797	20.24
9/64	.141	3.57	31/64	.484	12.30	13/16	.813	20.64
5/32	.156	3.97	1/2	.500	12.70	53/64	.828	21.03
11/64	.172	4.37	33/64	.516	13.10	27/32	.844	21.43
3/16	.188	4.76	17/32	.531	13.49	55/64	.859	21.83
13/64	.203	5.16	35/64	.547	13.89	7/8	.875	22.23
7/32	.219	5.56	9/16	.563	14.29	57/64	.891	22.62
15/64	.234	5.95	37/64	.578	14.68	29/32	.906	23.02
1/4	.250	6.35	19/32	.594	15.08	59/64	.922	23.42
17/64	.266	6.75	39/64	.609	15.48	15/16	.938	23.81
9/32	.281	7.14	5/8	.625	15.88	61/64	.953	24.21
19/64	.297	7.54	41/64	.641	16.27	31/32	.969	24.61
5/16	.313	7.94	21/32	.656	16.67	63/64	.984	25.00
21/64	.328	8.33						

Conversion—Millimeters to Decimal Inches

mm	*inches*	*mm*	*inches*	*mm*	*inches*	*mm*	*inches*	*mm*	*inches*
1	.039 370	31	1.220 470	61	2.401 570	91	3.582 670	210	8.267 700
2	.078 740	32	1.259 840	62	2.440 940	92	3.622 040	220	8.661 400
3	.118 110	33	1.299 210	63	2.480 310	93	3.661 410	230	9.055 100
4	.157 480	34	1.338 580	64	2.519 680	94	3.700 780	240	9.448 800
5	.196 850	35	1.377 949	65	2.559 050	95	3.740 150	250	9.842 500
6	.236 220	36	1.417 319	66	2.598 420	96	3.779 520	260	10.236 200
7	.275 590	37	1.456 689	67	2.637 790	97	3.818 890	270	10.629 900
8	.314 960	38	1.496 050	68	2.677 160	98	3.858 260	280	11.032 600
9	.354 330	39	1.535 430	69	2.716 530	99	3.897 630	290	11.417 300
10	.393 700	40	1.574 800	70	2.755 900	100	3.937 000	300	11.811 000
11	.433 070	41	1.614 170	71	2.795 270	105	4.133 848	310	12.204 700
12	.472 440	42	1.653 540	72	2.834 640	110	4.330 700	320	12.598 400
13	.511 810	43	1.692 910	73	2.874 010	115	4.527 550	330	12.992 100
14	.551 180	44	1.732 280	74	2.913 380	120	4.724 400	340	13.385 800
15	.590 550	45	1.771 650	75	2.952 750	125	4.921 250	350	13.779 500
16	.629 920	46	1.811 020	76	2.992 120	130	5.118 100	360	14.173 200
17	.669 290	47	1.850 390	77	3.031 490	135	5.314 950	370	14.566 900
18	.708 660	48	1.889 760	78	3.070 860	140	5.511 800	380	14.960 600
19	.748 030	49	1.929 130	79	3.110 230	145	5.708 650	390	15.354 300
20	.787 400	50	1.968 500	80	3.149 600	150	5.905 500	400	15.748 000
21	.826 770	51	2.007 870	81	3.188 970	155	6.102 350	500	19.685 000
22	.866 140	52	2.047 240	82	3.228 340	160	6.299 200	600	23.622 000
23	.905 510	53	2.086 610	83	3.267 710	165	6.496 050	700	27.559 000
24	.944 880	54	2.125 980	84	3.307 080	170	6.692 900	800	31.496 000
25	.984 250	55	2.165 350	85	3.346 450	175	6.889 750	900	35.433 000
26	1.023 620	56	2.204 720	86	3.385 820	180	7.086 600	1000	39.370 000
27	1.062 990	57	2.244 090	87	3.425 190	185	7.283 450	2000	78.740 000
28	1.102 360	58	2.283 460	88	3.464 560	190	7.480 300	3000	118.110 000
29	1.141 730	59	2.322 830	89	3.503 903	195	7.677 150	4000	157.480 000
30	1.181 100	60	2.362 200	90	3.543 300	200	7.874 000	5000	196.850 000

To change decimal millimeters to decimal inches, position the decimal point where desired on either side of the millimeter measurement shown and reset the inches decimal by the same number of digits in the same direction. For example, to convert .001 mm into decimal inches, reset the decimal behind the 1 mm (shown on the chart) to .001; change the decimal inch equivalent (.039" shown) to .00039").

Tap Drill Sizes

National Fine or S.A.E.		
Screw & Tap Size	Threads Per Inch	Use Drill Number
No. 5	44	37
No. 6	40	33
No. 8	36	29
No. 10	32	21
No. 12	28	15
1/4	28	3
5/16	24	1
3/8	24	Q
7/16	20	W
1/2	20	29/64
9/16	18	33/64
5/8	18	37/64
3/4	16	11/16
7/8	14	13/16
1 1/8	12	1 3/64
1 1/4	12	1 11/64
1 1/2	12	1 27/64

National Coarse or U.S.S.		
Screw & Tap Size	Threads Per Inch	Use Drill Number
No. 5	40	39
No. 6	32	36
No. 8	32	29
No. 10	24	25
No. 12	24	17
1/4	20	8
5/16	18	F
3/8	16	5/16
7/16	14	U
1/2	13	27/64
9/16	12	31/64
5/8	11	17/32
3/4	10	21/32
7/8	9	49/64
1	8	7/8
1 1/8	7	63/64
1 1/4	7	1 7/64
1 1/2	6	1 11/32

Decimal Equivalent Size of the Number Drills

Drill No.	Decimal Equivalent	Drill No.	Decimal Equivalent	Drill No.	Decimal Equivalent
80	.0135	53	.0595	26	.1470
79	.0145	52	.0635	25	.1495
78	.0160	51	.0670	24	.1520
77	.0180	50	.0700	23	.1540
76	.0200	49	.0730	22	.1570
75	.0210	48	.0760	21	.1590
74	.0225	47	.0785	20	.1610
73	.0240	46	.0810	19	.1660
72	.0250	45	.0820	18	.1695
71	.0260	44	.0860	17	.1730
70	.0280	43	.0890	16	.1770
69	.0292	42	.0935	15	.1800
68	.0310	41	.0960	14	.1820
67	.0320	40	.0980	13	.1850
66	.0330	39	.0995	12	.1890
65	.0350	38	.1015	11	.1910
64	.0360	37	.1040	10	.1935
63	.0370	36	.1065	9	.1960
62	.0380	35	.1100	8	.1990
61	.0390	34	.1110	7	.2010
60	.0400	33	.1130	6	.2040
59	.0410	32	.1160	5	.2055
58	.0420	31	.1200	4	.2090
57	.0430	30	.1285	3	.2130
56	.0465	29	.1360	2	.2210
55	.0520	28	.1405	1	.2280
54	.0550	27	.1440		

Decimal Equivalent Size of the Letter Drills

Letter Drill	Decimal Equivalent	Letter Drill	Decimal Equivalent	Letter Drill	Decimal Equivalent
A	.234	J	.277	S	.348
B	.238	K	.281	T	.358
C	.242	L	.290	U	.368
D	.246	M	.295	V	.377
E	.250	N	.302	W	.386
F	.257	O	.316	X	.397
G	.261	P	.323	Y	.404
H	.266	Q	.332	Z	.413
I	.272	R	.339		

ANTI-FREEZE INFORMATION

Freezing and Boiling Points of Solutions According to Percentage of Alcohol or Ethylene Glycol

Freezing Point of Solution	Alcohol Volume %	Alcohol Solution Boils at	Ethylene Glycol Volume %	Ethylene Glycol Solution Boils at
20°F.	12	196°F.	16	216°F.
10°F.	20	189°F.	25	218°F.
0°F.	27	184°F.	33	220°F.
−10°F.	32	181°F.	39	222°F.
−20°F.	38	178°F.	44	224°F.
−30°F.	42	176°F.	48	225°F.

Note: above boiling points are at sea level. For every 1,000 feet of altitude, boiling points are approximately 2°F. lower than those shown. For every pound of pressure exerted by the pressure cap, the boiling points are approximately 3°F. higher than those shown.

ANTI-FREEZE CHART

Temperatures Shown in Degrees Fahrenheit
+32 is Freezing

Cooling System Capacity Quarts	Quarts of **ETHYLENE GLYCOL** Needed for Protection to Temperatures Shown Below													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
10	+24°	+16°	+ 4°	−12°	−34°	−62°								
11	+25	+18	+ 8	− 6	−23	−47								
12	+26	+19	+10	0	−15	−34	−57°							
13	+27	+21	+13	+ 3	− 9	−25	−45							
14			+15	+ 6	− 5	−18	−34							
15			+16	+ 8	0	−12	−26							
16			+17	+10	+ 2	− 8	−19	−34	−52°					
17			+18	+12	+ 5	− 4	−14	−27	−42					
18			+19	+14	+ 7	0	−10	−21	−34	−50°				
19			+20	+15	+ 9	+ 2	− 7	−16	−28	−42				
20				+16	+10	+ 4	− 3	−12	−22	−34	−48°			
21				+17	+12	+ 6	0	− 9	−17	−28	−41			
22				+18	+13	+ 8	+ 2	− 6	−14	−23	−34	−47°		
23				+19	+14	+ 9	+ 4	− 3	−10	−19	−29	−40		
24				+19	+15	+10	+ 5	0	− 8	−15	−23	−34	−46°	
25				+20	+16	+12	+ 7	+ 1	− 5	−12	−20	−29	−40	−50°
26					+17	+13	+ 8	+ 3	− 3	− 9	−16	−25	−34	−44
27					+18	+14	+ 9	+ 5	− 1	− 7	−13	−21	−29	−39
28					+18	+15	+10	+ 6	+ 1	− 5	−11	−18	−25	−34
29					+19	+16	+12	+ 7	+ 2	− 3	− 8	−15	−22	−29
30					+20	+17	+13	+ 8	+ 4	− 1	− 6	−12	−18	−25

For capacities over 30 quarts divide true capacity by 3. Find quarts Anti-Freeze for the ⅓ and multiply by 3 for quarts to add.

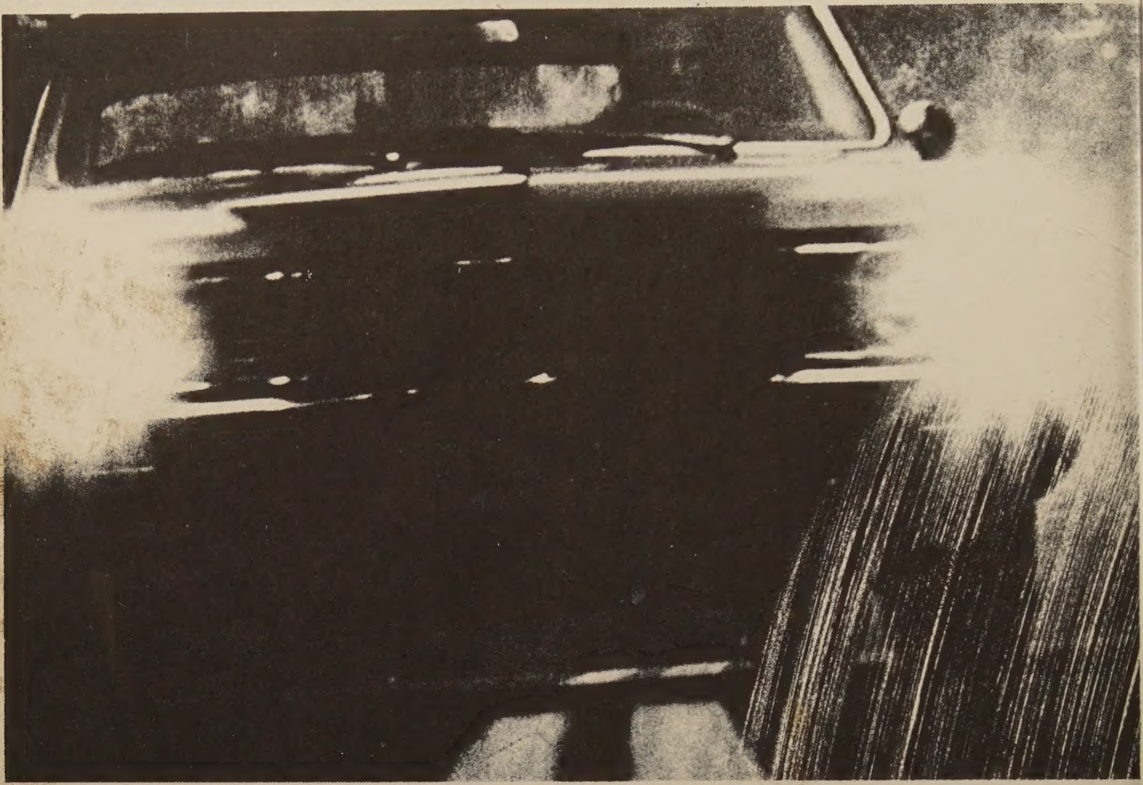
For capacities under 10 quarts multiply true capacity by 3. Find quarts Anti-Freeze for the tripled volume and divide by 3 for quarts to add.

To Increase the Freezing Protection of Anti-Freeze Solutions Already Installed

Cooling System Capacity Quarts	Number of Quarts of **ETHYLENE GLYCOL** Anti-Freeze Required to Increase Protection												
	From +20°F. to					From +10°F. to					From 0°F. to			
	0°	−10°	−20°	−30°	−40°	0°	−10°	−20°	−30°	−40°	−10°	−20°	−30°	−40°
10	1¾	2¼	3	3½	3¾	¾	1½	2¼	2¾	3¼	¾	1½	2	2½
12	2	2¾	3½	4	4½	1	1¾	2½	3¼	3¾	1	1¾	2½	3¼
14	2¼	3¼	4	4¾	5½	1¼	2	3	3¾	4½	1	2	3	3½
16	2½	3½	4½	5¼	6	1¼	2½	3½	4¼	5¼	1¼	2¼	3¼	4
18	3	4	5	6	7	1½	2¾	4	5	5¾	1½	2½	3¾	4¾
20	3¼	4½	5¾	6¾	7½	1¾	3	4¼	5½	6½	1½	2¾	4¼	5¼
22	3½	5	6¼	7¼	8¼	1¾	3¼	4¾	6	7¼	1¾	3¼	4½	5½
24	4	5½	7	8	9	2	3½	5	6½	7½	1¾	3½	5	6
26	4¼	6	7½	8¾	10	2	4	5½	7	8¼	2	3¾	5½	6¾
28	4½	6¼	8	9½	10½	2¼	4¼	6	7½	9	2	4	5¾	7¼
30	5	6¾	8½	10	11½	2½	4½	6½	8	9½	2¼	4¼	6¼	7¾

Test radiator solution with proper hydrometer. Determine from the table the number of quarts of solution to be drawn off from a full cooling system and replace with undiluted anti-freeze, to give the desired increased protection. For example, to increase protection of a 22-quart cooling system containing Ethylene Glycol (permanent type) anti-freeze, from +20°F. to −20°F. will require the replacement of 6¼ quarts of solution with undiluted anti-freeze.

WHEN A PROBLEM DRINKER DRIVES, IT'S YOUR PROBLEM.



Problem drinkers were responsible for 19,000 highway deaths last year. That is your problem.

Because they didn't kill only themselves. They killed people they loved, people they'd never met, people like you.

And they didn't only kill. They crippled and maimed and destroyed lives without actually taking them.

If your friend has a drinking problem, there are many ways you can help him. But first you must help him stay alive. So others may live.

If you are really his friend, don't help him drink. Admittedly, you alone probably can't stop a problem drinker from drinking. But you can discourage it.

If he has been drinking, don't let him drive. Drive him yourself. Call a cab. Take his car keys.

It won't be easy. After all, he is your friend. You don't want to hurt him or insult him. But the alternative is perhaps losing him.

Everything you think you can't do, you must do.

Write Drunk Driver, Box 2345, Rockville, Maryland 20852.

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